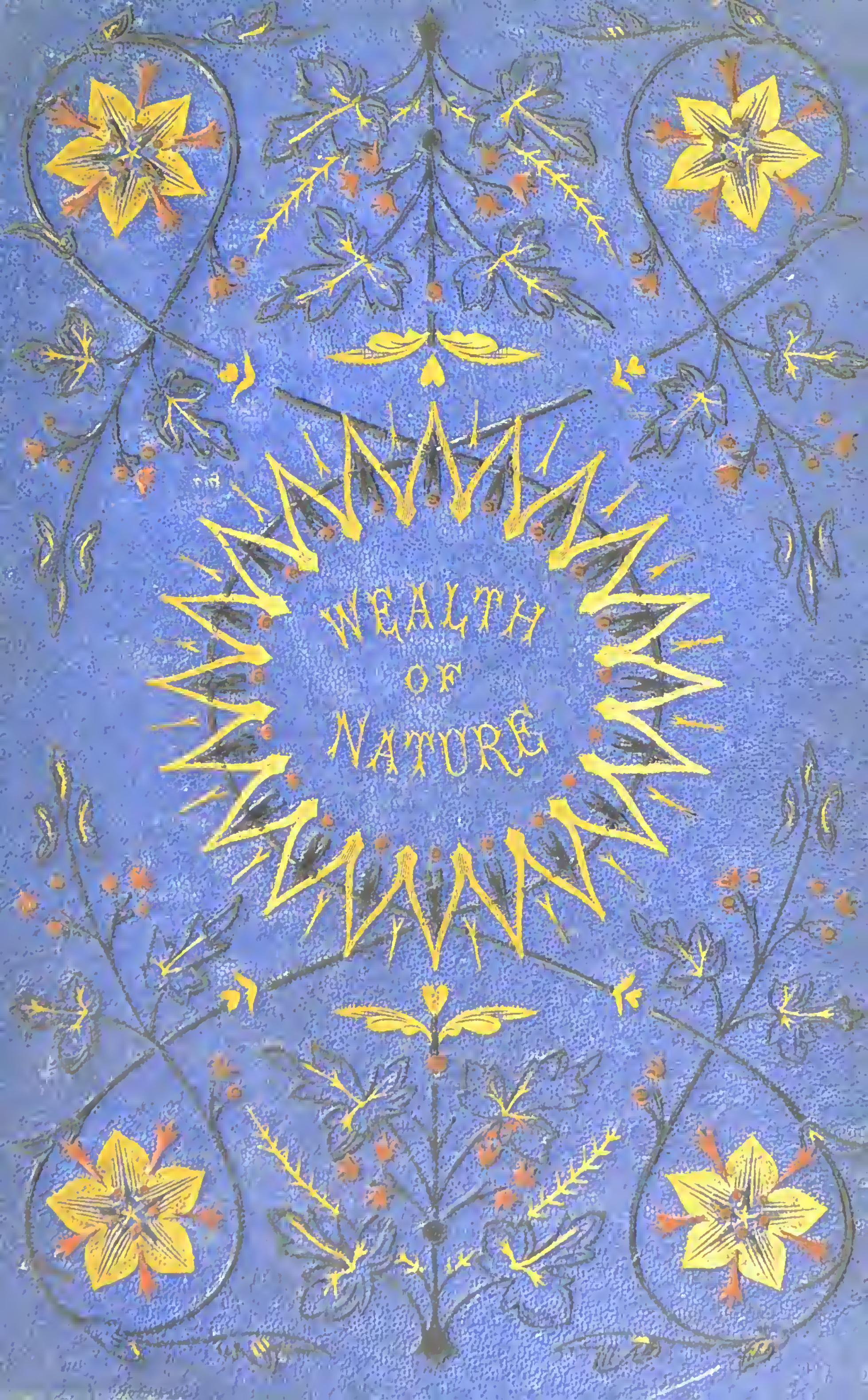

WEALTH OF NATURE

1/6

All Saints' Grammar School.

Qui studet optatam cursu contingere metam,
Multa tulit fecitque puer, sudavit et alsit.

Class II. – French

Arthur H. L. Stewart.

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Food and Raiment.—*Frontispiece.*

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THE

WEALTH OF NATURE

OUR FOOD SUPPLIES
FROM
THE VEGETABLE KINGDOM.

BY THE
REV. JOHN MONTGOMERY, A.M.

EDINBURGH:
WILLIAM P. NIMMO.
1870.

4550

MURRAY AND GIBB, EDINBURGH,
PRINTERS TO HER MAJESTY'S STATIONERY OFFICE.

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PREFACE.

THE present work is intended as the first of a series, on the subject of the Treasures of Nature viewed in their adaptation to the wants of Man, if the reception of it is so favourable as to encourage the author and publisher to proceed. It is proposed to treat of the whole subject of the productions of Nature with regard to their economical applications. The subject is a very large one; and even the part of it to which the present volume is devoted, has, of necessity, been imperfectly treated within its limits. The author, however, ventures to say that accuracy has been his first object, after which he has aimed at all possible completeness, and arrangement such as might make the book pleasant and useful to the reader. Omissions there unquestionably are—many of them intentional and unavoidable; others, it may be, unintentional, and which may be pointed out as faults; but it is hoped that nothing of much importance has been omitted.

The author asks pardon of his readers for a few expressions in some of the earlier chapters of the work, which indicate an intention of including more within a single volume than he has found it possible to include, without entirely omitting much of the information which he thought it desirable that the work should contain. It is almost unnecessary to add that he makes no pretension to originality. If his work is found clear, accurate, and free from important omissions, he will be satisfied.

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CHAPTER I.

INTRODUCTORY.

OF all the multitude of species which claim the attention of the naturalist, there is not one which has not its appropriate place and usefulness in the great scheme of creation. The three kingdoms of nature—the animal, the vegetable, and the mineral—are mutually related to each other. The mineral kingdom affords sustenance to plants, which form the vegetable kingdom, and these again afford sustenance to animals. Many animals prey upon other animals ; but this does not affect the general rule that the animal kingdom is dependent on the vegetable, as the vegetable is upon the mineral. Neither does it affect the ultimate relation of the vegetable kingdom to the mineral, that many plants—and particularly all the higher kinds—derive great part of their nutriment from animal and vegetable substances decomposed and forming part of the soil ; for these substances have all been originally formed from the animal kingdom itself: the roots of plants drawing the materials of them from the soil, or the leaves from the atmosphere. The minerals of which rocks are composed, become, when reduced to small particles by the action of the elements, the chief part of the soil, which varies much in quality and productiveness according to its mineral constitution, the soils of various districts differing very much in these respects according to their geological character. The lichen, which grows as a crust upon the rock, aids in the process of its disintegration, and by its own decay contributes to form a soil for other plants. Plants become the food of animals, and these again of other animals. It is not, however, merely as supplying food for animals, and for man himself, nor as affording materials to be employed for a vast variety of purposes, that plants are useful. In nothing does the wisdom of the Creator more admirably appear, than in that constant chemical action by which they maintain the purity of the atmosphere and restore the balance of its elements, which all kinds of animals are constantly subverting. By the processes of animal life, the oxygen of the atmosphere is consumed. Part of it is combined with the blood, with which it is brought into contact in the lungs or otherwise, according to the structure of the animal, and so sent into further combinations to compose solid or fluid particles in all parts of the frame, which particles may subsist long, and pass through many changes, and pertain in succession to a whole series of organized beings ere they are resolved again into their pristine elements. Part of it enters into combination with carbon, which it abstracts from the blood, and which the blood has carried away from different parts of the animal system, in the progress of that continual work of removal and renewal which goes on in the whole material frame of every living creature ; and this part is exhaled in the form of carbonic acid, the breath which we exhale being very different in chemical composition and qualities from the breath we inhale. Thus the air is vitiated and unfitted for the support of animal life both by the abstraction of its oxygen, and by the admixture of carbonic acid,—a gas which is absolutely noxious, and if present in considerable quantity, is soon fatal to any animal compelled to breathe it. Hence, chiefly, the injurious effects of crowded apartments and of close beds, where there is no proper circulation of air to remove that which has been vitiated by breathing, and to supply the poor human occupants with a tolerable quantity of this first requisite of life. What then is to prevent the vitiation of the whole atmosphere of the world by this constant process, until it becomes like that of the Black Hole of Calcutta? The atmosphere is not so immense in volume that the constant action of all the animals that breathe it, continued from hour to hour and from age to age, can produce no sensible effect. Circulation of air is what we want for our crowded chambers and too densely peopled cities; but what would circulation of air avail if there were no provision for the purity of the whole mass of air—no compensation for the destructive process continually carried on by all the animals that breathe upon the face of the earth? This compensation is found in plants. Animals exhaust the oxygen of the atmosphere; plants supply it again. Animals breathe forth the carbonic acid, which, when it accumulates around them, they cannot breathe again without injury, distress, and ultimately death; but plants find in this carbonic acid the very nutriment which they need, and drink it in by multitudinous pores. More of the carbon than of the oxygen which it contains being requisite for the formation of those organic substances which are the products of vegetation, and of which vegetable frames are constructed, the carbonic acid being decomposed, its carbon is appropriated by the plant, and the greater part of its oxygen, along with oxygen obtained by the decomposition of water, is sent forth to make the atmosphere of to-day as fresh and pure as that of yesterday, or as that which was breathed by the first of the human race. The solar system, with all its harmony of seemingly conflicting forces, and the regularity which results in the motions of its mighty orbs, is not more admirable than this system of circulation and mutation ; this mutual adaptation of the animal and vegetable kingdoms. Our admiration would probably increase if we could penetrate farther into the mysteries of nature ; if, for example, we knew more of the influences of the sun's rays and of electricity, which, as they are mainly instrumental in producing the currents and motions of the atmosphere necessary to the maintenance of a general uniformity in its constitution, are probably also the principal causes of the processes of vegetation, and of the currents, the decompositions, and the recombinations which take place in all the cells and vessels of each plant itself.

It is not the purpose of the present work, however, to treat of the relations of animal and vegetable life, nor of any part of the general economy of nature. It is not even intended to show how any creature may be indirectly useful to man, but only what uses man himself has been able to make of the different species of the mineral, vegetable, and animal kingdoms, which the beneficent Creator has placed under his power. This subject is itself a very large one, of which many of the less important particulars must be passed over unnoticed. An outline is all that can be attempted.

From the mineral kingdom we derive materials for house-building and other purposes of architecture, manures extremely useful for the improvement of soils, and some of our most prized articles of ornament. To it also we are indebted for the metals which we employ for so many purposes; the knowledge and working of which are among the surest proofs of civilisation, and have greatly tended to promote it. The vegetable kingdom supplies us with much of our food, with part of the materials of house-building, and with great part of those which we use for our clothing, as well as with those of which household furniture, and utensils, and implements of many kinds are made, with dye-stuffs and other substances used in the arts. To the animal kingdom we are indebted for great part of our food and of our clothing, as well as for many miscellaneous articles of great utility. Medicinal substances are obtained from all the three kingdoms, but most largely and in greatest variety from the vegetable.

Regarding the earth as given to man for his use, we cannot but observe with grateful admiration the number and variety of its valuable products. Nor can we fail to consider how of its minerals the most useful are most widely and abundantly distributed. Gold and gems are rare; but iron, lime, and coal are plentiful. In coal we seem to have a special provision for our wants, the produce of long geological periods ere yet the earth was fit for man's habitation, but whilst it was in preparation for him. A similar remark may be made as to our limestone rocks, to which incalculable multitudes of creatures that once had life have contributed their remains. When we turn our eyes to the animal and vegetable kingdoms, it might seem at the first glance as if nothing were specially intended for man; for whatever part of a plant or animal he appropriates to his use, has its use also for the plant or animal itself. The flesh of the ox consists of the muscles necessary for the animal's existence; the corn of which we make our bread is the seed of the grass that yields it; the tuber of the potato is a winter store for the plant, that it may be ready to send up vigorous shoots in the spring; the fibres of the stem of flax are essential to its strength and elasticity. But in all this there is a bountiful provision for us, as good and acceptable as if what we could make available for our use consisted of mere products or excrescences having no other apparent purpose in nature.

There are a few species of plants and animals which, in different parts of the world, supply almost all the wants of rude tribes. The Laplander thus depends on the reindeer, the savage of the South Sea Islands on the cocoa nut. Naturalists and authors who described the South Sea Islands used to vie with each other in extravagant praises of this tree. The kernel of the nut is used for food; and the unexpanded terminal bud, like that of other palms, boiled and eaten like cabbage, is esteemed a delicacy. The milk which is found in the interior of the nut is a pleasant and refreshing beverage. The oil, obtained by expression from the kernel, is valuable both as an article of food, and for most of the purposes for which olive oil is used. The juice of the stem, which is easily obtained in great abundance when the tree is about to display its flowers,

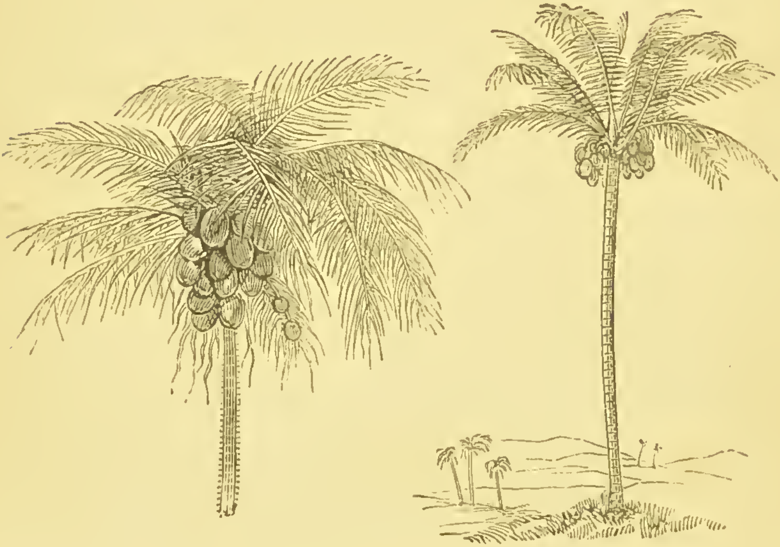

Fig. 1.—Cocoa Nut Tree.

is agreeable and wholesome, and affords by evaporation a considerable quantity of sugar, or, if allowed to ferment, becomes a pleasant wine, from which, by distillation, an ardent spirit may be obtained. The stem of the tree is employed in the construction of houses; the hard exterior part of it is readily adapted to the making of many articles; the extreme hardness of the lower part, and the beautiful polish which it receives, fit it for purposes in which ornament is sought as well as utility. The leaves are used for thatching houses, as well as for making fences, buckets, and baskets; torches are made of them; the midribs of the leaves are made into oars; the reticulated substance at the base of the leaves is made into cradles. The small fibres of root are used for making baskets and other articles of wicker-work. The fibrous rind of the nut affords material for excellent cordage, and has now become an article of commerce for the manufacture of ropes and mats.

The *Mauritia flexuosa*, a species of fan palm, is more important to the Guarani Indians of South America than ever the cocoa palm was to the South Sea Islanders. 'The benefits of this life-supporting tree are widely celebrated,' says Humboldt in his work on the aspects of nature in different lands and in different climates; 'it alone, from the mouth of the Orinoco to north of the Sierra de Imataca, feeds the unsubdued natives of the Guaranis. When this people were more numerous, and lived in closer contiguity, not only did they support their huts on the cut trunks of the palm trees as pillars, on which rested a scaffolding forming the floor, but they also, it is said, twined from the leaf-stalks of the *Mauritia* cords and mats, which, skilfully interwoven and suspended from stem to stem, enabled them in the rainy season, when the Delta is overflowed, to live in the trees like the apes. The floor of the raised cottages is partly covered with a coating of damp clay, on which the women make fires for household purposes, the flames appearing at night from the river to be suspended high in the air . . . The *Mauritia* affords to the Guaranis not only a secure dwelling-place, but also various kinds of food. Before the flower of the rich palm tree breaks

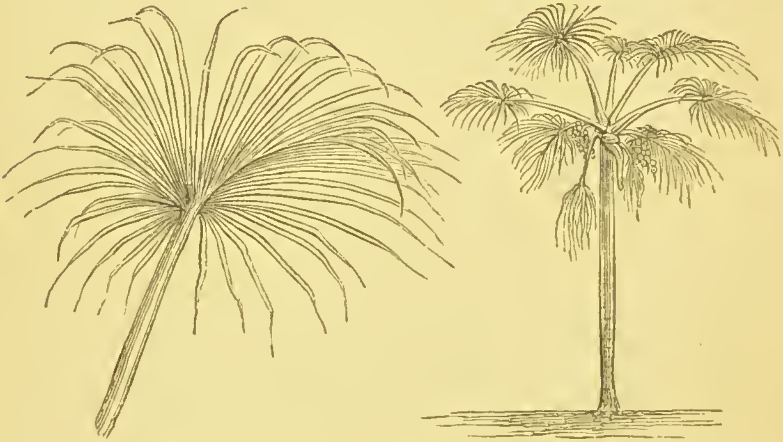

FIG. 2.—GUARANI PALM.

through its tender sheath, and only at that period of vegetable metamorphosis, the pith of the stem of the tree contains a meal resembling sago, which, like the farina of the *Jatropha* root, is dried in thin bread-like slices. The fermented juice of the tree forms the sweet intoxicating palm wine of the Guaranis. The scaly fruits, which resemble in their appearance reddish fir cones, afford, like the plantain, and almost all tropical fruits, a different kind of nutriment according as they are eaten, after their saccharine substance is developed, or in their earlier and more farinaceous state. Thus in the lowest stage of man's intellectual development we find the existence of an entire people bound up with that of a single tree, like the insect which lives exclusively on a single part of a particular flower.'

But this dependence on a particular plant or animal is possible only in the rudest states of society. The Laplander is dependent on his reindeer, and therefore on the reindeer moss, which affords it food ; the tropical savage on the palm-tree ; the poor Irishman on the potato. With these conditions of existence, however, rudeness, ignorance, and wretchedness are necessarily associated. 'In those countries,' says the eminent political economist Ricardo, 'where the labouring classes have the fewest wants, and are contented with the cheapest food, the people are exposed to the greatest vicissitudes and miseries. They have no refuge from calamity; they cannot seek refuge in a lower station ; they are already so low that they can fall no lower. On any deficiency of the chief article of their subsistence, there are few substitutes of which they can avail themselves, and dearth to them is attended with almost all the evils of famine.' These statements may be illustrated by reference not only to the potato failure of Ireland, and all the misery caused by it, but also to the frequent famines of great districts of India, where rice is the chief food of the common people, which occur when an extraordinary drought prevents for a season the production of the usual crop. Security against famine in a great measure consists, under God upon whom we are at all times dependent, in the variety of the food supplies which his bounty has bestowed on us; the cause which injuriously affects one kind not equally affecting others at the same time. There is a melancholy interest in comparing the recommendation of the potato by Mr. Buckland, a public-spirited gentleman of Somersetshire, to the Royal Society in 1663, as a plant, the general cultivation of which throughout the kingdom might help to guard against famine, with the facts of 1846 and other years, when grievous famine ensued from the failure of this very crop. But was Mr. Buckland wrong? Or was the Royal Society wrong in adopting his opinion, as at least to some extent it seems that it was adopted? By no means. The cultivation of the potato has certainly long served the purpose of warding off famines or grievous dearths, which the scarcity of corn would have occasioned. But when the peasantry of Ireland fell into a state of complete dependence on it, it ceased to serve the purpose for which enlightened benevolence sought at first to promote its cultivation, and became connected with a state of things which no patriot nor philanthropist could contemplate with satisfaction. It pleases some to dwell with a kind of poetic sentimentalism on the happy and simple lives of those who have few wants, who are altogether ignorant of many things which in refined societies have come to be reckoned among the necessaries of life. But a little inquiry into facts will soon dispel the delusion. True religion, indeed, produces contentment where it prevails, but it produces also habits of mind most inconsistent with a complacent satisfaction in the lowest outward conditions. A moment's reflection will show whether it is best that human wants should be limited to a mud cabin and a potato plot, or that they should be extended to ceiled houses, carpeted rooms, and variously-furnished tables, with all the comforts of civilised life.

It has often been remarked that the productions of different parts of the world are those most suitable to the wants of their inhabitants. The abundance of fruits in tropical countries is an instance of this kind; and in the arctic regions, where fruits and corn are not produced, animal food, which is almost the only kind of food to be obtained, is also the kind of food requisite for the support of life under the conditions of climate. The gifts of God, however, are not so distributed that any country produces all that is really desirable for its inhabitants. Little of what we gather from the earth is of mere spontaneous growth, and the most important cultivated plants, now widely diffused, appear to have been originally natives of very limited districts. Man has a greater power of accommodating himself to different climates and circumstances than any of the inferior animals, or any species of plant; and as his wants increase with increasing civilisation, commercial intercourse becomes necessary for their supply. In this we behold an admirable display of divine wisdom and goodness; for the intercourse of the inhabitants of different countries is productive of benefits far exceeding in importance the advantage derived from a mere exchange of commodities. Commerce binds together the widely separated branches of the human family; ships, steamboats, roads, and railways become requisite for its purposes, and become instrumental in the extension of knowledge, of civilisation, and of Christianity itself.

CHAPTER II.

HUMAN FOOD—THE CORN PLANTS.

THE food of man is derived entirely from the vegetable and animal kingdoms. The occasional eating of earth by some savage tribes is to be ascribed to a morbid appetite, and affords no real sustenance. If there is an exception in the *berg-mehl*, or mountain meal of Norway, it is owing to the presence of organic matter in the mineral substance itself, derived from organisms of a former geological period. Water may be said to be the only substance belonging to the mineral kingdom which is necessary or suitable for the stomach, except for medicinal purposes; and important and indispensable as it is, we do not generally reckon it among the articles of food.

Our food supplies are derived from many widely different orders of plants, and also from widely different groups of animals. Yet it is remarkable to how great an extent we are dependent on particular tribes of the one kingdom and of the other. Our bread-stuffs, for example, are almost exclusively derived from the seeds of the grasses; and when we turn to the animal kingdom, we find our chief dependence to be on the flesh of one order of mammalia, the order of ruminants. Many species, belonging to other orders in both kingdoms, are indeed valuable as contributing to our food supplies; but these are notably prominent, as affording us far more than all the rest. Again, if we consider the class of birds, we find that almost all of them, except the birds of prey, are good for food; but few of them are of any considerable value, except those which belong to two groups—the order of gallinaceous birds, as the common fowl and the turkey, pheasants, partridges, grouse, etc., and the order of *Natatores*, or web-footed birds, of which the goose and the duck are the most important. Few reptiles are used for food, except by mere savages, although some, as the turtle and iguana, are esteemed as delicacies by the most civilised races. Of fishes, almost all are eatable, although a few are poisonous; but the species of chief value belong almost exclusively to a few families, of which the *Clupeidæ*, or herring family, the *Salmonidæ*, or trout and salmon family, the *Gadidæ*, or cod and haddock family, and the *Pleuronectidæ*, or flat fishes, of which the turbot and flounder are examples, are the most important. Some of the lower tribes of the animal kingdom afford articles of food, as the molluscs, of which the oyster and mussel are familiar examples; but the amount of our food supplies derived from them is comparatively small, although probably, with due care, it might advantageously be made larger than it is. In the vegetable kingdom also, the lowest tribes contribute little to our food supplies. Many of the sea-weeds appear capable of being used for food, or of affording substances which might be so used; but few of them are actually used, and these only to a small extent. The same remark applies to the other cryptogamous or acrogenous plants generally, although some of the *Fungi* are much esteemed, and some—in Britain at least—are unduly neglected. The food supplies which we derive from the vegetable kingdom are mostly, however, from the endogenous and the exogenous plants, amongst the various orders of which food-producing plants are numerous.

Among the plants which supply food for man, the first place must be assigned to the *Cerealia*, or corn plants, of which wheat, barley, oats, rye, maize, and rice are the most important. Guinea corn and different kinds of millet are also pretty extensively cultivated in some parts of the world. All these are grasses, and their seeds are called *grain* or *corn*. The seeds of all the grasses are indeed farinaceous; and, with scarcely a single exception —or, perhaps, it may be said, without a single well-established exception in the whole of the great natural order, which contains almost 4000 known species—they are wholesome. But those cultivated as corn plants are superior in the size of the seed, the abundance in which it is produced, or the facility with which it is collected.

All the cereal grasses have been cultivated for a very long time, and some of them from the earliest ages of human history. It is not certainly known, with regard to most of them, and these the most important,—unless, in virtue of recent discoveries, wheat may now be regarded as an exception,—of what countries they are natives, insomuch that it has even been doubted if they were ever truly wild; and the supposition has been entertained that they have existed only in the possession of man from the first. A fable of the ancient mythology represented Ceres as having first taught men to cultivate corn plants.[1] All plants which have long been cultivated have been much modified by cultivation, and many new varieties have been produced, which, however, if neglected, show a continual tendency to return to the original type of the species. Thus kale, cabbage, cauliflower, brocoli, Brussels sprouts, and kohl-rabi, are all varieties of one species, the wild state of which is well known, and scarcely more esteemed than any other weed of the sea-coast. But there are limits to such modifications, and nothing can be more improbable, or less supported by any show of evidence, than the opinion which has been confidently put forth, that the corn plants, or at least all those commonly cultivated in Britain, were originally one. It is absolutely ridiculous to allege in support of this opinion, as the author of the *Vestiges of the Natural History of Creation* does, that if a field is sown with one kind, and it is allowed to sow itself by scattering its own seed, plants of the other kinds will in a few years be found among its produce. Is there no other way of accounting for such a fact than by supposing that one grain has been transmuted into another, as wheat into oats or barley? It would be requisite that all possibility of accident should be excluded; it might fairly be demanded also that we should see, what no man has yet shown or seen, the intermediate states. We find intermediate states enough among the varieties of the species already referred to—the *Brassica oleracea;* and every gardener knows how apt cabbages or cauliflower are to renounce their esteemed peculiarities, and to degenerate into something like coleworts or open kale. But a form intermediate between wheat and oats, or wheat and barley, or between any one of our corn plants and another, has never yet been found. To the careless observer, some of the bearded or awned varieties of wheat, particularly when a field is looked at from a little distance, may seem to resemble barley; but the slightest examination shows that the characteristics are entirely those of wheat, and in the qualities of the grain there is not the slightest approach to those of barley. The length or shortness, presence or absence of awns, has a great effect on the general aspect of a grass, but in nothing is variation more frequent or of less importance.

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[1] 'Prima Ceres ferro mortales vertere terram
Instituit, quum jam glandes atque arbuta sacra
Deficerent silvæ, et victum Dodona negaret.'

VIRG. *Georg.* I. 147-149.

Whilst the notion, therefore, that all the corn plants are originally one, and that one of them may still be readily changed into another, must be unhesitatingly discarded, yet, considering what we know of the effects of modifying circumstances, and especially of long-continued cultivation, it seems not improbable that we have only one true species in cultivation of each of the genera to which our corn plants belong, as of wheat, oats, or barley. It is often exceedingly difficult to determine the boundaries of species and varieties ; and many of those which, in the present state of science, are for convenience described as distinct species, must be looked upon as only provisionally registered.

The grain of which the cultivation extends farthest north, and so is the corn plant of the coldest parts of the world, is barley, or rather the coarser species or variety called *bear* or *bigg*. The northern limit of oats approaches nearly to that of barley. Crops of grain are reaped within the arctic circle ; it is cultivated to a small extent in Lapland, in a much higher latitude than in any other part of the world. Barley and oats are the principal grains of the northern parts of Scandinavia. More to the southward, rye is associated with them, and is most extensively cultivated on the shores of the Baltic and in many parts of continental Europe and of Asia, especially where the soil is sandy, supplying the bread which is chiefly used by the inhabitants of Denmark, the north of Germany, and many parts of Russia. In more southern parts, and where the soil is suitable, rye and the other grains already mentioned give place to wheat, which is the principal grain crop of the middle and south of Europe, its cultivation everywhere increasing as agriculture is improved and extending. Wheat is largely cultivated also in many parts of Asia and of the north of Africa, and is a principal crop in the northern parts of the United States, and in Canada, in Australia, and wherever European colonies have been established in the temperate zones. Wheat can be advantageously cultivated in countries which have a hot summer, even although the cold of winter is great, and succeeds better in such countries than where the average temperature of the year is somewhat higher, but where the grain, in its season of ripening, does not enjoy the same amount of heat and bright sunshine. Its cultivation extends into sub-tropical regions, although in these it is no longer the principal crop; and we find it, as in Natal and the south of Mexico, ascending to elevated tablelands or the slopes of mountains, and leaving to other crops the lower and warmer portions of the country. In the warmer climates, other things being equal, the crops of wheat which reward the labour of the husbandman are both more abundant and of finer quality than in the colder ones, until again we reach a certain limit, where the heat becomes too great for the constitution of the plant. When we approach the limits of wheat in the equatorial direction, maize or Indian corn begins to appear, a grain which is known to be a native of America, and is more largely cultivated in that than in any other quarter of the globe, but which has found its way into Asia and Africa, far beyond the limits of what we ordinarily call civilisation ; is a chief crop in the Australian colonies, and is cultivated to a considerable extent in the south of Europe. Its cultivation has been attempted in England ; but, even in the southern counties, with little success. In the countries of which the climate is adapted to it, it is recommended both by the facility of its cultivation and the great abundance of the crop which it yields, far exceeding that of wheat, or of any other grain. It is a plant of very luxuriant growth, attaining a far greater size than any of the other cereals, and approaching in appearance to the great grasses of the tropics. After maize, in climates still a little warmer, rice begins to be cultivated ; both maize and rice extending into the torrid zone, and flourishing along with the banana, the yam, the cocoa nut, and the bread-fruit. Rice is a native of the East, and its cultivation is still most extensive in India and China ; but the rice of Carolina has long had a high reputation in our markets, and this grain is now produced in the warmer climates of all quarters of the globe. It requires for its growth a great supply of water, and seems naturally adapted to the swampy plains on the banks of great rivers ; but its cultivation is also carried on in fields artificially irrigated, and even on steep hill slopes. The cultivation of rice is carried farther to the northward in China and Japan than in any other part of the world. In Europe it is practised only to a small extent in the countries bordering on the Mediterranean. Besides these grains, there are others, which will be afterwards noticed, which are less extensively cultivated, and chiefly in the warmer parts of the globe. Several of these bear the common name of millet, or are nearly allied to those which do. Of the kinds of grain to which this name is applied, two or three kinds are occasionally cultivated in Europe, and even in the middle parts of it; but their cultivation has seldom been attempted in Britain.

Of all kinds of grain, maize has the greatest range of climate; but rice is the staple food of the greatest number of human beings, although it is not well adapted for being made into bread, and is chiefly used in other forms. Maize, also, although it is made into cakes, is more suitable for other uses; and wheat, by almost universal consent, is regarded as the best kind of grain for making bread. Its use for this purpose has increased very much with the increase of wealth and the improvement of agriculture in Britain. It is not yet the principal bread-corn of the northern, nor even of the middle parts of the continent of Europe, and it is only of late years that its use has become general among the humbler classes of the people of Scotland; nor was it until the beginning of last century that it prevailed among the labouring population of England. In former times bread made of barley, oats, or rye was commonly used, and wheaten bread more rarely, except by the most wealthy families. The extent of ground sown with wheat was proportionally much smaller than now, and the produce per acre was also much inferior. So recently as the beginning of the reign of George III., it was calculated that almost as great a number of the inhabitants of England subsisted on bread made of barley, rye, or oats, as on bread made of wheat ; and about the same period, the use of wheat in the northern parts of England was almost exclusively limited to the rich. 'About fifty years ago,' says Eden in his *History of the Poor*,[1] written in 1797, 'so small was the quantity of wheat used in the county of Cumberland, that it was only a rich family that used a peck of wheat in the course of the year, and that was used at Christmas. The usual treat for a stranger was a thick oat-cake, called *haver-bannock*, and butter. An old labourer of eighty-five remarks, that when he was a boy, he was at Carlisle with his father, and wishing to indulge himself with a penny loaf made of wheat flour, he searched for it for some time, but could not procure a piece of wheaten bread at any shop in the town.'

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[1] The quotation is borrowed from the *Library of Entertaining Knowledge*.

It is not always in the regions where wheat is most abundantly produced that its use is most general. The poor peasants of the wheat-producing districts of Russia seldom taste wheaten bread. The general use of this article of food may be taken as an indication not so much of the natural capabilities of the soil, as of the progress which a people have made in opulence and general comfort.

CHAPTER III.

WHEAT.

WHEAT is mentioned in the book of Genesis (Gen. xxx. 14) in a manner which shows it to have been an important crop in the days of Jacob. It was, from the earliest historic ages, one of the principal corn plants of Egypt, and was extensively cultivated by the Jews, the Syrians, and other eastern nations in times of very remote antiquity.

We do not think it necessary to give a botanical description of wheat, nor of other familiar plants. The genus to which wheat belongs (*Triticum*) contains a number of species, natives of temperate climates, some of them natives of Britain, of no value to the agriculturist. One species, the common couch grass or squitch (*T. repens*), is a troublesome weed in cultivated fields, common in Britain and in most parts of Europe, and now also widely diffused, through accidental importation of the seed, in North America. In this genus the flowers, and subsequently the seeds, are closely arranged in ears or spikes on the upper extremity of the stalk ; the spikes, however, being composed not of separate and distinct flowers, but of *spikelets*, each containing a number of flowers or *florets.* The ears of wheat, barley, and rye bear a kind of resemblance to each other, and the general appearance greatly differs from that of oats, rice, and millet, as well as from that of maize. Some kinds of wheat have the lower of the *paleæ*—the innermost chaffy covering of each grain—elongated into an awn ; in others it merely terminates in a point. The former kinds are known as bearded wheat. It has been already mentioned that this is not a distinctive mark which can be much depended upon in determining the boundaries of species ; and there can be no doubt that in wheat at least it is very liable to be modified by cultivation.

It appears indeed to be probable, and almost certain, that wheat is a modified form of a grass common in some parts of the south of Europe and in the warmer temperate parts of Asia, known to botanists as *Ægilops ovata.* The genus *Ægilops* is distinguished from *Triticum* chiefly by its more numerous awns. The glumes—the external chaffy covering of the grain—in *Ægilops* are generally terminated by three or four awns, prolongations of their ribs, and the paleæ by two or three short awns. The spikelets of the ear in *Ægilops ovata* are also much more easily broken from the *rachis*, or central stalk, than those of wheat. In cultivation, however, this grass soon loses the awns of the paleæ and of the lateral ribs of the glumes, and thus assumes the characters of wheat, whilst the spikelets at the same time become less liable to be broken off; the grain increases in size, and the floral envelopes—the glumes and paleæ—proportionally diminish; the leaves, however, become larger, and the stem stronger. It is commonly stated in recent botanical works, that the discovery of the relation between *Ægilops ovata* and wheat was made not very many years ago by M. Fabre, a botanist of Agde, in the south of France. The botanical identity of the two plants was, however, suspected long before by Professor Latapie, of Bordeaux, who made some experiments in the cultivation of the *Ægilops*, and found that it changed its character so as to approach that of wheat. To M. Fabre belongs the credit of having thoroughly carried out experiments of this kind, until the result was no longer doubtful. It was some time, indeed, before botanists generally admitted the reality of the discovery; but the experiments of M. Fabre have been repeated with the same result, and the conclusion now appears to be almost beyond controversy. The effects of cultivation are very rapid. M. Fabre sowed seeds of *Ægilops ovata* in 1838, and obtained wheat of fair quality in 1846. Professor Buckman, of the Royal Agricultural College in England, sowed seeds of *Ægilops ovata* in 1855, and notwithstanding the disadvantages of cold seasons and of a cold situation in the Cotteswold hills, he found the spikelets much modified in 1859. The annexed cut, fig. 3 (1), shows a spikelet of *Ægilops ovata,* as the plant grows wild in the regions surrounding the Mediterranean, and the same (2), as modified by cultivation from 1855 to 1859, on the Cotteswold hills. For comparison, an ear of bearded wheat is represented in (3).

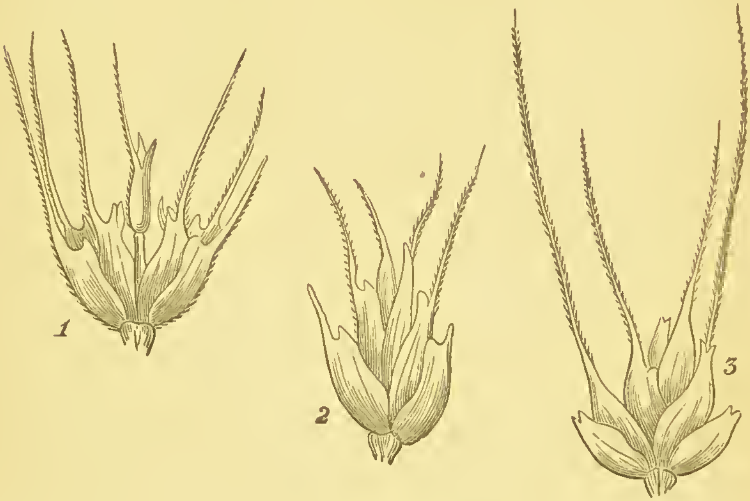

FIG. 3.—BEARDED WHEAT.

It has been common to regard cultivated wheat as derived from several distinct species, the most important of which have been supposed to be Summer Wheat (*Triticum æstivum*) and Winter Wheat (*T. hybernum*); the characteristics chiefly relied on being found in the length or shortness of the awn, although in the application of the names to the awned and awnless kinds there is diversity arising in fact from the uncertainty of the character. The names *summer* and *winter wheat* have reference to the time of sowing, which is either in autumn or spring. But all the kinds included under these names are by the greater number of botanists reduced to one species, *Triticum vulgare*, or *T. sativum;* nor does there appear to be any good ground of distinction. The number of varieties is very great, and new ones are continually attracting notice. These varieties differ from each other in such particulars as those already mentioned concerning the awn; in the form and colour of the seed, which sometimes tapers a little towards the extremity, and is sometimes almost of uniform thickness throughout; in the compactness with which the grains are arranged in the spike; in the colour of the grain, which in some varieties is nearly white, in others reddish or reddish brown; and in the form, size, and appearance of the grain, which in some kinds is very plump, in others more elongated, and has in some a dull, opaque appearance, in others a kind of horny or silicious translucency. Some varieties—known by the general name of Woolly Wheat—are also distinguished by having the grain covered with a short, soft down, of which the other kinds are entirely, or almost entirely free. Differences in the length and stoutness of the straw are also taken into account by agriculturists in distinguishing the different varieties which they cultivate. The thinness or thickness of the chaff is another important particular, the thin-chaffed wheats being generally preferred.

The immemorial practice in the culture of wheat, as of other grains, has been to sow broad-cast ; but in the earlier half of last century the method of sowing in drills, by means of an implement adapted for that purpose, was introduced in England by Mr. Tull, and has become gradually more general, being attended with a large saving of seed and other advantages. This method had previously been introduced in the south of Europe, but was nowhere employed to any considerable extent, until it began to prevail in the best situated and best cultivated farms in Britain.

A single plant of wheat has sometimes only one stalk, but often a number of stalks. There is a most beneficent provision of nature against the damage which might be expected from the attacks of insects and other casualties when the plant is young. Even if the top of the shoot is destroyed, no serious injury is sustained; new shoots are produced, and several spring up instead of the one which existed before. By dividing and transplanting as frequently as possible whilst the plant is young, curious cultivators have succeeded in obtaining an enormous produce from a single seed. One gentleman has recorded in the *Philosophical Transactions*, that by dividing and subdividing one plant, he obtained within one season no fewer than five hundred plants, all healthy and vigorous, and still with the propensity to *tiller* or extend at the root; so that the average number of ears to each plant being not less than forty, the whole number of grains was estimated at nearly six hundred thousand.

The limits of the present work do not permit much notice of the varieties of wheat in cultivation. The probability appears to be that they all belong to one original species, although some botanists have recently attempted to refer them to different species of *Ægilops*, which, however, are perhaps themselves nothing more than mere natural varieties. If summer wheat and winter wheat (*Triticum æstivum* and *T. hybernum*) are not to be regarded as distinct species because of the absence or presence of awns, we shall not readily find a reason for regarding the square or compact wheat and the Egyptian or many-spiked wheat as anything else than mere varieties of the common kind, although the former has by some botanists been designated *Triticum compactum* and the latter *T. compositum.* Nor has the turgid wheat (*T. turgidum* of some authors) any better claim to the rank of a separate species. It is remarkable for its swollen glumes, as the square or compact wheat is for the form of the ears. Turgid wheat is awned; compact wheat is awnless. There are numerous sub-varieties of both, and they are pretty extensively cultivated in some parts of the continent of Europe, but none of them in Britain. The many-spiked or Egyptian wheat, sometimes also called Abyssinian wheat and mummy wheat, is remarkable for its compound ears, which seem like a cluster of ears; but this peculiarity is by no means permanent. It is commonly said that this variety of wheat was obtained from seed found in an Egyptian mummy case, but there is no good authority for the statement. It is extensively cultivated in the north of Africa, and in some parts of the south of Europe. Hard wheat is another kind, which by some botanists has been described as a distinct species (*Triticum durum*), and of which there are numerous varieties extensively cultivated in the countries bordering on the Mediterranean Sea, and in Arabia, Persia, and India. It is remarkable for its elongated and flinty or horny grains. The ears are also broad and compressed, generally very short in proportion to their breadth, and always awned. Wheat of this kind is imported to some extent into Britain; but the climate is unsuitable for its growth. More distinct in its characters than any of these, but still probably a mere variety, is Polish wheat (*Triticum Polonicum*), which is remarkable for the great length of its glumes—the outer chaff, the *calyx* of the older botanists, within which are the *florets*, constituting, with the two glumes, a single *spikelet*. These are more than an inch in length, or twice the length of the florets, and are also more membranaceous than in the ordinary kinds of wheat. The florets are awned, the spikes, or ears, long and loose, and the grains large, about an inch in length, and very hard. This kind of wheat is extensively cultivated in some parts of the north of Africa, and in the south of Siberia. It was cultivated to a small extent in England in the latter part of the seventeenth century, but is now only to be seen in botanic gardens.

Besides all these, there are other kinds of wheat, differing more considerably from the ordinary type, and which may therefore with greater probability be regarded as specifically distinct, having the general characteristic of the chaff adhering to the grain so as not easily to be separated. First among these may be named spelt (*Triticum spelta*, also called

T. zea and *T. dicoccum*), a grain cultivated in Italy in the days of the ancient Romans, and which is supposed to be the *zea* of the Greeks. The ears are long, thin, and almost awnless; the spikelets generally contain three florets, of which one is abortive. Closely allied to this, although distinguished by the compressed, bearded, and crowded spike, are certain varieties often also included under the name spelt, but regarded by some as forming a separate species (*Triticum amylaceum*). Agreeing in the character of its grain with all these is the one-seeded wheat (*T. monococcum*), known in some parts of Europe as St. Peter's corn, remarkable for having only two rows of grain in the ear, the spikelets containing only two florets, one of which is abortive. The ears are small, much compressed, with closely crowded spikelets and long awns. This kind is chiefly cultivated in the higher parts of the Alps, where no other kind of wheat will succeed; and in somewhat similar situations, both in Switzerland and elsewhere on the continent of Europe, different kinds of spelt are sown with great advantage. Their cultivation has scarcely been introduced into Britain, although it has been long ago recommended as at least well worthy of trial in elevated situations. They might also be expected to succeed on soils on which no farmer would think of sowing any other kind of wheat. The grain is not, indeed, so good as ordinary wheat for making bread, but is used for other purposes, and is excellent for feeding horses.

Of all the corn plants, wheat is the best for the making of bread, and wheat flour alone is much used for making leavened bread. The bread made of the meal of the other *cerealia* is generally in the form of cakes, unleavened. The processes of the mill and of the bakehouse must here be left unnoticed, although it would be very interesting to trace the former from their rudest stage to their present perfection ; and the latter are of special interest in a scientific point of view, from the employment of *leaven* or *yeast* to produce fermentation, which is arrested, ere it is far advanced, by the heat of the oven. The effects produced in dough by leaven are due to the extremely rapid growth and reproduction of a minute fungus, the *yeast plant*, and to chemical changes resulting from its vegetation. This plant (*Mycoderma cerevisii*) is the same which causes fermentation in the juice of grapes, and in the wort from which beer is made, to which, therefore, we are indebted for all our fermented liquors, and so, therefore, also for distilled liquors or *spirits* of all kinds. Its seeds or *spores* are probably diffused by the atmosphere, so that fermentation readily takes place through their germination in substances suitable for their growth. They must be extremely minute, the fully developed organism itself being so small that a single cubic inch of yeast contains more than eleven hundred millions of individuals. The brewer and the baker induce rapid fermentation by adding a little yeast to the wort or to the dough.

In the preparation of wheat flour, the outer and harder part of the grain, called bran, which is coarser and of a darker colour than the rest, is usually separated by sifting it out, and is used for feeding horses, pigs, or other animals. Bread made of the 'whole wheat' is, however, also used, and is sometimes recommended as more suitable to the digestive organs than the ordinary kind of bread. Bran is more nutritious than the finest wheat flour.

Macaroni, of which vermicelli may be considered as a mere variety, is a preparation of wheat flour very much used in Italy, and largely imported into Britain. The wheat grown in Britain cannot advantageously be employed for the manufacture of macaroni, the excellence of which seems to depend upon peculiar qualities of the grain, only to be found when it ripens under the sun of a sub-tropical region, or in some of the varieties there cultivated.

CHAPTER IV.

BARLEY.

BARLEY is mentioned in the ninth chapter of the book of Exodus as one of the common crops of Egypt more than three thousand years since. An ancient legend ascribed the introduction of its cultivation to the goddess Isis, and represented it as the first kind of grain cultivated by man.

The genus to which barley belongs (*Hordeum*) contains a number of species, some of which are common in Britain, very much resembling it in general appearance, but with nothing whatever of its usefulness. The cultivated kinds are generally regarded as belonging to several distinct species, and the distinguishing characters are perhaps more marked than in wheat; but there is considerable probability that, after all, they are mere varieties, resulting from peculiar circumstances and long cultivation. One distinction very much depended upon is the number of rows of grain in the ear—the inflorescence in this genus, as in wheat, assuming the form of an ear or spike. In the spike of the genus *Hordeum*, the spikelets are placed in threes upon opposite sides of the rachis—the elongation of the stalk which forms the *axis* of the spike,—and each spikelet contains only a single floret. It generally happens that in the two lateral spikelets of the three which thus grow together, the florets are male, containing stamens only, and therefore barren, in which case they are also awnless, whilst the central floret is hermaphrodite, and its lower *palea* is produced into a very long awn, serrated upon two opposite sides. The ear thus exhibits from the first two opposite rows of awns, and eventually consists of two rows of grain; and this is the characteristic of the *Hordeum distichon* of botanists,—some importance being also attached to the circumstance that the grains are closely appressed to the rachis, the awns on each side also proceeding in the same direction, and nearly parallel to each other. To this species or variety belong many of the cultivated kinds in highest esteem; the superior quality of the grain over that of other kinds compensating for its somewhat inferior quantity. The ears in some kinds are three or four inches in length, and the number of grains in an ear is from twenty-four to thirty. But in some kinds of cultivated barley the florets are all hermaphrodite and awned, each floret producing a seed or grain; and they either form four or six rows, the four-rowed being *Hordeum vulgare*, and the six-rowed *H. hexastichon* of botanists. This distinction, however, does not appear to be permanent, and the ear is often found to have six rows at the base, and only four at the apex, the two lateral rows on each side combining into one. To these species or varieties belong the coarser kinds of barley, generally known by the name of *bear*, and some of which are also called *bigg*. They are preferred for cultivation in the coldest climates, or where circumstances are otherwise unfavourable. The ear is shorter than in the two-rowed barley, but the number of grains is greater,—as many as sixty or seventy in the ear. Besides these, a fourth species is generally distinguished,—sprat barley, or battledore barley (*Hordeum zeocriton*), which has shorter and broader ears than any of the other kinds, the ear being two-rowed, but the seeds and awns standing out from the rachis instead of being appressed. It is little cultivated, being regarded as in every way inferior to the other kinds.

As the cultivation of wheat has more and more prevailed in Britain, the proportion of that grain to barley being now much greater than in former times, so the cultivation of the finer kinds of barley has increased in proportion to that of the coarser kinds. The absolute quantity of wholesome and nutritious human food thus produced is not so considerable as the same land might otherwise yield; but the increased regard to the quality of the produce may be accepted as a sure indication of national prosperity. The barley grown in Britain, as well as that imported from foreign countries, is, indeed, chiefly used not for food, but for making ale and whisky. The use of unleavened bread made of barley meal is now no longer general, although it still prevails to a considerable extent in some parts of the country, as it does also more generally in some of the northern countries of Europe. Barley, deprived of its skin by a process of rubbing, is much used under the names of Pot Barley, Pearl Barley, etc., as an ingredient in broths, and for making gruel and barley-water.

Barley is generally sown in spring, but sometimes at the beginning of winter. It is a short-lived plant, and requires a briefer season than any other kind of grain; so that even when it is the latest sown, it is the first to ripen. This, more than any superior capacity for enduring cold, is its recommendation to the inhabitants of the Arctic regions. Some of the varieties excel others in this respect; and in Lapland the harvest commences in little more than six weeks after the sowing of the grain. Seed brought from the far north might, perhaps, afford a variety adapted to cultivation at greater elevations than any kind at present in use in Britain. In the south of Europe two crops of barley are sometimes obtained from the same field in one year.

CHAPTER V.

RYE.

THE name of rye occurs in the English translation of the Bible, in the book of Exodus, as that of one of the crops of the Egyptians; and it is again met with in the twenty-eighth chapter of Isaiah; but it is very doubtful what plant is really meant in these places. Rye has certainly been in cultivation from a very early period. It succeeds well in climates too cold for wheat, although it does not extend so far north as either barley or oats; but it yields a good crop on soils too poor for either of them, and is cultivated with advantage on moorish soils in elevated situations, and on dry, sandy soils which would otherwise be almost wholly unproductive. This, more than any peculiarity either of climate or of national taste, is the reason of its very extensive cultivation on the shores of the Baltic. It is, indeed, the principal grain crop of all the countries bordering upon that sea, except at the most northern parts of the Gulf of Bothnia, and supplies the bread chiefly used by their inhabitants. The peasantry of Sweden subsist chiefly on rye cakes, which they bake only twice a year, and which are therefore generally as hard as ship biscuits; but rye bread may be kept longer than any other kind of bread without deterioration of quality. In consequence of the large proportion of gluten which the grain contains, it is capable of being made into a spongy kind of brown bread, which derives a sensible sweetness from the sugar that exists in the grain; for rye contains about five per cent. of sugar, whereas, in other kinds of grain, sugar is only formed when the grain begins to germinate, as in the process of malting.

The ear of rye resembles that of wheat or barley, its awns giving it a greater resemblance to barley, although in its botanical characters it is more nearly allied to wheat. The generic difference between wheat (*Triticum*) and rye (*Secale*) is not great, and some species of no known value, natives of the south of Europe, have sometimes been referred to the one genus, and sometimes to the other. No species of *Secale* is found in Britain, and the number of known species is very small. The cultivated kinds of rye are in general referred without hesitation to one species, *Secale cereale*, of which the native country is unknown.

In former times rye was pretty extensively cultivated in England, and in some parts of the country it was the principal bread-corn. It is now cultivated only to a small extent in Britain, and is more frequently sown in November to supply green food for cattle in spring, than for any other purpose. Of the grain which is reaped, a considerable part is used by tanners, as it has a peculiarly strong tendency to pass into the acetous state of fermentation, and the acid thus produced is found useful in preparing hides for the action of tannin. Rye is much used by distillers, especially by those of Holland, for making gin.

Ergot of rye was long regarded by many botanists as a mere diseased condition of the grain, a monstrous growth of the germen, occasioned by damp weather and other causes. Others ascribed this peculiar condition to the presence of a small parasitical fungus; and this opinion has now been fully ascertained to be correct, and the natural history of the fungus is almost as well known as that of rye itself. Interesting as this subject is, we must refrain from entering upon it, and merely refer to the medicinal value of *ergot*, and to the danger which attends the use of rye for food, when grains affected with ergot are ground into meal. Calamitous consequences have often ensued from the use of such meal. Gangrene is apt to attack the fingers and toes of those who eat it, and the disease even extends throughout the body, so as sometimes to produce death. It is attended with excruciating pain. Epidemics arising from the prevalence of ergot in crops of rye have sometimes occurred in various parts of the continent of Europe,—most frequently when a wet spring has been followed by a very hot summer. One of the most fatal was that of 1709, in the Orleanois and other parts of France. Similar effects have, however, been known to result from the use of other kinds of grain in bad condition, in which also some kind of minute fungus was probably present. In the *Philosophical Transactions* for 1762, a most melancholy story is related of the sufferings of a labourer's family in Suffolk, caused by the use of *laid* wheat.

CHAPTER VI.

OATS.

It is probable that the cultivation of oats is not of so high antiquity as that of wheat, barley, and rye. This grain is at present most extensively cultivated in some of the northern parts of Europe. Its cultivation extends farther northwards than that of any other grain except barley, and almost as far as that of barley. In the equatorial direction its range is more limited, and the quality of the grain becomes inferior. It is strictly a corn plant of the colder temperate climates.

The genus (*Avena*) to which this grain belongs, is one which contains a large number of species, natives of temperate climates, and pretty widely distributed over the world. Several species are natives of Britain, and some of them are valuable for the herbage which they afford. The inflorescence differs widely from that of the kinds of grain already noticed, consisting of a loose *panicle*, the spikelets drooping, and each containing two or more florets. The glumes are as long as the florets, and, in the drooping position of the florets, effectually shield them, and afterwards the ripening seeds, from rain ; to which circumstance must, in part at least, be ascribed the capacity of oats to endure without injury a greater amount of wet weather than any other kind of grain cultivated in the world,—a beneficent provision of the all-wise Creator for those countries in which wet weather often prevails.

The number of florets in each spikelet differs much in different species of the genus *Avena.* In the cultivated oats, however, the fertile florets, and consequently the grains, are in general only two, sometimes three in number. In the wild oat (*A. fatua*), a weed of our corn-fields, there are three fertile florets in each spikelet, and these are hairy at the base, rough, and the outer palea of each furnished with a long awn, which arises from the back of the palea, and is *kneed*, or suddenly bent, below the middle, and twisted—twisting and untwisting itself according to the state of the atmosphere, so that it is an excellent hygrometer, and gives a creeping motion to the grain when laid on a table. The awns of the other species in like manner spring from the back of the palea, and are more or less kneed and twisted ; but in the cultivated oats they are in general comparatively short, and only one in each spikelet; in some varieties they entirely disappear. The supposition that the *Avena fatua* may be the original of some or all of the cultivated kinds, is one which may not unreasonably be entertained. It is not easy to discover such distinguishing characters as cultivation and change of circumstances may not be supposed to have produced. Until further evidence is obtained, however, the cultivated kinds must be regarded as constituting a distinct species. It has, indeed, been common for botanists to distinguish at least four species of cultivated oats, *Avena sativa*, *A. orientalis*, *A. brevis*, and *A. nuda*. Of these, *A. sativa* has the panicle spreading pretty widely on all sides. *A. orientalis* has the branches of the panicle all turned to one side, and somewhat crowded; both of them having the glumes longer than the florets or the grains, and the paleæ smooth, or nearly so. *A. brevis* has the florets always awned, and about equal in length to the glumes, which are somewhat obtuse at the apex, the grain also terminating abruptly at both ends. *A. nuda* differs more considerably from the rest than they do from each other, having three or more fertile florets in each spikelet, the florets longer than the glumes, and one or two of them awned, the paleæ large and not adhering to the seed as in other kinds of oats.

Of the cultivated varieties of oats, which are very numerous, the greater number possess the characters ascribed to *A. sativa ;* but some, of excellent quality and great productiveness, generally known as *Tartarian oats*, are referred to *A. orientalis. A. brevis* is scarcely at all cultivated in Britain ; but in some of the mountainous parts of France and Spain it is preferred to all other kinds, being very hardy, early in ripening, and adapted to poor soils. *A. nuda*, the naked oat, has been sometimes cultivated in Britain, but never to a large extent. It is very prolific, and grows well on poor soils, and especially on soils which contain a considerable proportion of peat, but has the disadvantage of readily shaking when nearly ripe.

Besides these, another species is sometimes cultivated, a native of Britain, not unfrequently occurring as a weed amongst other kinds of grain,—the bristle-pointed oat, *Avena strigosa*, which has the lower palea of each floret terminated by two long bristles, the awn appearing to spring from between them. Its general appearance is very similar to that of the common wild oat. There are two perfect florets in each spikelet. It is said that this was at one time the kind of oats chiefly cultivated in Scotland ; and until recently its cultivation has prevailed in some parts of the north, and in the Orkney and Shetland Islands. In France this plant is cultivated, not for the grain, but for the straw, or in order to afford green food for cattle, a use to which all kinds of oats are advantageously applied in climates too warm for the production of the grain.

Until recently, the bread chiefly used in Scotland was oat-cake, which indeed is still to a large extent the case; and porridge made of oatmeal is still a principal article of food. The agricultural labourers of some districts feed chiefly on *brose*, which is not boiled like porridge, but made by stirring oatmeal about in hot water, and is eaten with the addition of milk. Brose, three times a day, is the food of some of the ploughmen. So constant a use of one kind of food is not good; although, from the peculiar chemical constitution of the grain of oats, it is fitter than any other kind of grain, or perhaps than any other product of nature, to be the chief article of human food. It is rich in gluten, and contains more fatty matter than any other kind of corn; the next to it in these respects being maize. The use of milk along with oatmeal not only renders it more palatable, but adds to the wholesomeness and nutritiousness of the food; so that human life can be better sustained on this than perhaps on any other uniform kind of food whatever. Experience, however, shows that the continual use of one kind of food, in this as in other cases, is unfavourable to health, vigour, and longevity. The imperfect cooking of the oatmeal made into brose is also unquestionably disadvantageous. In the form of porridge, properly boiled, it would be more wholesome.

In former times this grain supplied also to a great extent the food of the inhabitants of many parts of England. A prejudice arose against it, as not only coarse, but inferior in nutritive quality, which the researches of modern chemistry have proved to be entirely erroneous. Various preparations of the *groats* (skinned grains), and of the meal, are now regarded as particularly suitable for invalids and for children. It is a partial return to the porridge and milk of the nurseries of former times. Dr. Johnson's jest about oats being food for men in Scotland and for horses in England, was far from being in accordance with the fact as to a large part of England when he published his dictionary, and had no other connection with any kind of truth.

This grain is scarcely ever sown in autumn or winter, like wheat or barley, but almost always in spring.

CHAPTER VII.

RICE.

RICE (*Oryza sativa*) is believed to be a native of tropical Asia, but is now cultivated in all warm countries, in swampy places, by means of irrigation. From the earliest historic ages it has supplied the principal food of the inhabitants of the East Indies and of China. The grain, however, containing a smaller amount of albuminous substances, is less nutritious than any other grain extensively cultivated or used.

Rice is a plant in size and general appearance similar to the ordinary corn plants of Europe, more resembling oats, however, than any of the others. Its inflorescence is in the form of a panicle; the spikelets are one-flowered; the glumes small; the paleæ nearly equal, cartilaginous, and ribbed, the lower either with or without an awn. There are six stamens, instead of three—the number found in almost all the grasses of Britain. Many varieties are cultivated, some of which differ so much that, as in the case of the other corn plants, they have sometimes been described as distinct species. The panicles are more contracted than in oats, and the spikelets are not drooping, but erect. In some of the varieties with long awns, the branches of the panicle have a considerable resemblance to ears of barley. The awnless varieties present a very different appearance. The cartilaginous paleæ form a rough yellow husk for the ripened grain, which adheres to it with considerable tenacity, and must be removed by friction between millstones. A thin pellicle which covers the seed within this husk is also removed by a similar process.

The cultivation of rice was introduced into Carolina in the end of the seventeenth century. Its introduction is ascribed to accidental circumstances, although somewhat different accounts are given of it. According to one of these, the first rice grown in Carolina was produced from seeds sown by the accidental shaking of a bag which had contained this grain for ship's stores. Without ever having become a chief article of food in that country, it is now extensively cultivated both there and in other warm parts of America, and forms an important article of export. Carolina rice is larger in grain, and bears a higher price in the market, than the produce of the countries of which rice is believed to be indigenous.

Various methods are adopted in the cultivation of rice; but an abundant supply of water is a chief requisite. In China the seed is steeped before being sown, and the surface of the ground at the time of sowing is in a soft, muddy condition. The plants are afterwards individually transplanted, and the utmost care is bestowed in hoeing, weeding, and irrigating, water being laboriously conveyed to the fields by buckets when irrigation cannot easily be accomplished. In Carolina the seed is sown by the hand in trenches, the regularity of the drill being carefully preserved; water is allowed to flow into the trenches to the depth of some inches, remaining for about a week; and the fields are flooded from time to time during the season, remaining in that state during the period of the ripening of the grain. In Spain and Italy water covers the ground in the rice-fields during the whole time of the growth of the crop; and in Valencia the harvest operations are actually conducted by reapers wading to their knees in water. In Ceylon and some parts of India rice is often grown upon the slopes of hills, on terraces, one above another,—the water, which is often conducted for a mile or more along the hill, being made to descend from one terrace to another in succession.

The cultivation of rice is so unhealthful, that in Carolina the low grounds, in which it is carried on, are abandoned entirely to the negroes during the time of it. The alternate floodings and drainings of the Carolina rice-fields must tend to aggravate the evil. Restrictions were imposed upon the cultivation of rice by the government of Milan because of the diseases which it was found to induce.

There is, however, a variety of rice called *Mountain Rice,* which requires less water than the common kind, and endures, without injury, greater cold. It is cultivated in Nepaul, in situations where it is covered by snow in winter, like wheat or barley, and receives no other supplies of moisture than it may obtain from the atmosphere, in a climate, however, which is one of the most rainy in the world. An attempt made by Sir Joseph Banks to cultivate this kind of rice in England was a complete failure, in so far as the production of grain was concerned; but he succeeded in obtaining a very luxuriant herbage, so that he thought the plant might be useful to supply green food for cattle if the seed could be readily procured from abroad.

Besides the use of rice for food, it is much used in the East for making ardent spirits. Much of the *arrack* of India is made from it, although the term arrack is used in the East to designate spirituous liquors in general, and is often applied to a kind made from the sap of palms.

The *Wild Rice* of Canada is a quite different plant from the true rice, although like it a grass, and belonging to a nearly allied genus. It is the *Zizania aquatica* of botanists. The inflorescence is panicled, and the flowers monoecious, — the stamens and pistils in distinct flowers on the same plant,—whereas in the genus *Oryza* they are hermaphrodite. The spikelets are one-flowered, and the seed is enveloped in the paleæ, one of which is provided with an awn. This plant abounds about the margins of lakes and in shallow streams in Canada and throughout the north-west of America, extending far to the north, and affording food not only to multitudes of aquatic birds, but also to the native tribes. It attains a height of from six to ten feet. The grain is often gathered by Indians paddling about in canoes. This grain has never been cultivated in any part of the world. It seems not improbable, however, that it may yet prove of great economic importance, and may afford the means of turning to profitable account many tracts which, without it, could not contribute much to the supply of human wants. But although indigenous to a country of which the winters are very severe, it seems to require a warm summer for its ripening, and attempts to cultivate it in Britain have failed. The grain, when ripe, is larger than common rice, being cylindrical, and from half an inch to three-quarters of an inch in length, of a dark brown colour, and of a flinty hardness.

CHAPTER VIII.

MAIZE.

MAIZE, or Indian Corn (*Zea Mays*), is believed to be a native of the north of Mexico, and of the southern districts of the Rocky Mountains. It was cultivated by the inhabitants both of North and South America at the time of the discovery of that continent by Europeans. Its cultivation has now extended into all the warm regions of the globe; and in many parts of the East it has already had the good effect of abating the exclusive dependence of the common people upon rice, so that their means of subsistence are less precarious, and less connected with conditions unfavourable to health.

Maize differs much in appearance from all the corn plants already noticed. The culm, or stem, is strong, and attains a height of from seven to ten or even fourteen feet; although there are varieties, chiefly cultivated in the coldest regions to which this grain extends, that are only about four feet high. The leaves are large, and of considerable breadth, often from one foot to two feet long, and two or three inches broad.

The plant is *monoecious*—the male and female parts being produced in separate flowers. The male flowers are produced in a large terminal panicle, generally called in America the *tassel;* whilst the female flowers are in lateral spikes or ears, of which there are generally about three on each stalk, at various distances from the ground, and enveloped in tough spathes. The spikelets are two-flowered, but one of the florets is abortive, consisting of mere paleæ. The grains or seeds are naked, roundish, and compressed, closely ranged together in eight or ten rows. They are yellow, or, in some varieties, reddish, in others white or greenish. They vary much in size; the smallest, however, being larger than the largest grains of wheat or barley. The spike or ear in the largest kinds is eight or ten inches in length, and five or six inches in circumference, the ear containing two hundred grains or upwards. The ears of

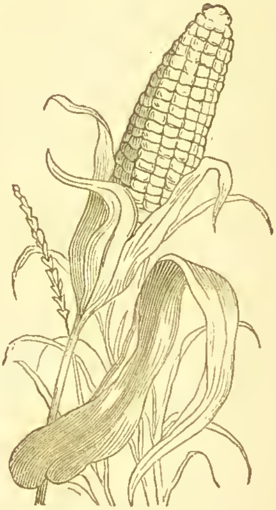
FIG. 4.—MAIZE.

the smallest kinds are four or five inches in length. The return, whether calculated according to seed or land, is much greater than in any other grain crop. In some places maize has been known to yield 800-fold, and a return of 350 or 400-fold is not uncommon in sub-tropical regions, and where there is a sufficient supply of moisture.

Only some of the smallest and least productive varieties of maize can at all be cultivated in Britain. The climate, even in the south of England, is not warm enough. In favourable seasons, maize has sometimes been ripened in Scotland, but this cannot be reckoned upon. On the continent of Europe, the summer being warmer, even when the average temperature of the year is not greater, this branch of agriculture is more successfully prosecuted.

One of the smaller varieties of maize is still called *Cobbett's Corn*, from the zeal with which the well-known William Cobbett laboured to introduce its cultivation in England.

In the harvesting of maize a very different course is pursued from that familiar to the inhabitants of all parts of the world as to the other grain crops. The crop is not cut down and conveyed into the barn or stackyard, there to remain till threshed; but the ears are plucked off and conveyed to the barn, to be kept in what are called in America *corn-cribs*, the name *corn* being there popularly applied to this grain, as it is in other countries to the most common grain in each. The ears are afterwards *shelled* by being drawn smartly across the edge of a fixed plate of iron or blunt knife. The *shelling* is the separation of the seeds from the rachis to which they are attached. The stalks of maize are cut down after the grain has been secured, and are used as food for cattle, being very saccharine and nutritious. They contain so much sugar that it has been manufactured from them, as from the sugar-cane. It is said that the Mexicans prepared and used this sugar before the Spanish conquest.

Maize succeeds best in light, rich, deep, and rather moist soils, and dislikes shady situations. It is very generally planted in little hillocks, raised at intervals, and to each of which four or five seeds are allotted. North American settlers generally make it their first crop on newly cleared and very partially tilled ground, on which it succeeds when any other grain crop would fail.

Maize is very nutritious and wholesome. An unreasonable prejudice against Indian corn meal is entertained by many in Britain, but no such feeling exists in the countries in which it is produced ; nor are British colonists long in accommodating themselves to their new circumstances. It cannot, however, be used for the making of leavened bread, except that it may be mixed in small quantities with the flour of wheat; but it is readily made into cakes, and is much used in the form of a porridge called *mush* in the United States. Maize, very coarsely ground and boiled, is the *hominy* of the Southern States of America, the chief food of the negroes. The tender green ears, roasted or boiled, and eaten with salt and butter, are very pleasant. These unripe ears are called in America *cobs*, a name which, however, belongs also to the rachis, and is employed to denote it when the grain has been separated by shelling.

The grains of maize make a very palatable kind of groats. The meal, mixed with rye meal, is used to make the common brown bread of New England. The entire grains are known in America by the name of *hulled corn* or *samp*. The unripe grains, slightly roasted, burst and turn inside out, assuming a very peculiar appearance. In this state they are an esteemed article of food in America, and are called *pop-corn*. Pop-corn is now frequently to be seen in shops in Britain. The meal of maize has also become much more common than it once was in the market, and is the cheapest of all kinds of meal. It was scarcely at all imported until the Irish famine of 1846; and when it was then distributed in Ireland, starving wretches were absolutely unwilling to receive it, and regarded their misery as insulted when it was offered. The Irish poor are now, however, the principal consumers of it in the British Islands. If its value were more generally known, and the foolish prejudice against it overcome, it might advantageously be imported to a very large extent, and contribute to the comfort of many a poor family. There is no grain of which an abundant supply could be so constantly secured.

The starch of maize is much used as an article of food, and is sold as *Corn flour*, *Oswego flour*, etc. It resembles arrowroot in its properties, whilst its much greater cheapness renders it acceptable to many.

Maize, like other grains, is used for making intoxicating beverages. Of this notice will be taken in another part of this work.

Chili maize, or Valparaiso corn (*Zea curagua*), is another species of maize, distinguished by serrated leaves. It is a smaller plant than the common maize, and a native of Chili. It has obtained a superstitious regard, because its grains, when roasted, split in the form of a cross.

CHAPTER IX.

MILLET, AND THE OTHER LESS IMPORTANT GRAINS.

THERE are some corn plants which, although cultivated to a considerable extent, are much less important to mankind than those already noticed. Amongst these the first place must be given to the different kinds of millet. By this name, however, plants very different from each other are designated, not only distinct as species, but belonging to different genera, although agreeing in the roundish form and small size of the grain which they produce, as well as in its quality.

Common millet (*Panicum miliaceum*) is cultivated in India, in the south of Europe, and in other warm countries. It is probably a native of India. It is there called *Waree.* The seeds are about one-eighth of an inch in length, ovate, smooth, and shining, varying in colour, being in some kinds white, in others grey, in some yellow, in some almost black.

The culm[1] is about three and a half or four feet high; the leaves long, broad, and slightly hairy; the panicle loose and nodding; the spikelets two-flowered, but one of the flowers generally barren. This grain is cultivated with advantage on light sandy soils, where there is not sufficient moisture for rice.

Other species of *Panicum* are also cultivated in India, as *P. frumentaceum*, called *Shamoola* in the Deccan, and *P. pilosum*, or *Bhadlee.* Both of these differ much in general appearance from *P. miliaceum*, the inflorescence being in the form of divided panicled spikes. They succeed best on light and rather dry soils, and yield very abundant crops. *Penicillaria spicata* (also known as *Holcus spicatus* and *Pennisetum typhoideum*), a species of an allied genus, is cultivated in some parts of India under the name of *Bajree.* It is also cultivated in Egypt, and is therefore sometimes called Egyptian millet. Its cultivation has been introduced in the south of Europe, but only to a very small extent. It succeeds best on light soils. The panicle is cylindrical, and almost spiked. The ripened grain somewhat resembles very small wheat. *Paspalum exile*, a species of another allied genus, is cultivated in the west of Africa, where it is called *Fundi* or *Fundungi.* The grain is small. It is much used both by Europeans and negroes in Sierra Leone, with stewed meat, or made into porridge with milk. *Paspalum scrobiculatum* is the *Koda* of India, a grain not extensively cultivated, and chiefly on poor soils.

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[1] This term is commonly used to designate the *stem* of grasses.

German millet and Italian millet belong to a genus (*Setaria*) nearly allied to the kinds already noticed. The spike is compound and cylindrical. The spikelets are two-flowered, but the lower floret is merely rudimentary. German millet (*S. Germanica*), and Italian millet (*S. Italica*), have by some been regarded as distinct species, by others as mere varieties of the same; the Italian millet being the larger and stronger of the two, and requiring a warmer climate to bring it to perfection. It is cultivated to a considerable extent in the south of Europe, and in India; the German millet pretty extensively in the middle of Europe. Both are capable of resisting drought to a degree which, in some countries and situations, makes them very valuable. In Britain they are seldom sown, the moisture of its climate adapting even its light soils better for other kinds of grain, and the late ripening of millet being found an additional disadvantage. The grain both of Italian and German millet is very small, only about one-sixteenth of an inch in length; but they are extremely prolific. The produce is estimated at about five times that of wheat. A single spike of Italian millet sometimes yields two ounces of grain. The grain is imported into Britain in considerable quantities to be used like rice, and for the feeding of poultry. It is very acceptable to some kinds of cage birds.

The name of Polish millet is given to *Digitaria sanguinalis*, a grass found in a few places of the south of England, but much more common in some parts of the continent of Europe. Its seeds are boiled and used like rice. It is cultivated in cottage gardens in Poland. It has a compound spike, the spikelets all on one side. The genus is closely allied to *Panicum*.

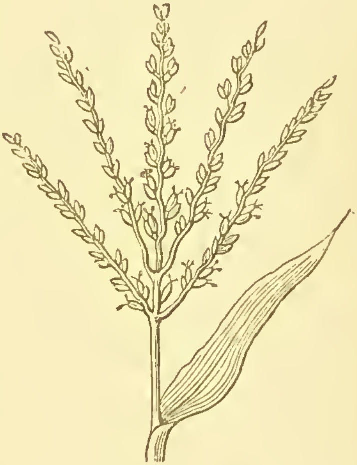
FIG. 5.—POLISH MILLET.

Durra, or Indian millet, is a more important plant than perhaps any of these. It is the *Sorghum vulgare* of some botanists, is called Durra in Arabia and Egypt, *Jowaree* and *Jondla* in some parts of India, and in the West Indies *Negro corn*, or *Guinea corn*. In all these countries it is cultivated to a considerable extent, as well as in China and Cochin-China, and to a greater or less extent in almost all tropical countries, and countries which have a warm summer of considerable duration, as in some parts of North America, and in Europe as far north as the southern parts of Germany. In England it grows, but rarely ripens. In countries of which the climate is adapted to it, this grain is found profitable on account of the large return which it yields even on poor and gravelly soils. In the amount of produce it is exceeded by no grain, except maize. It attains a height of five or six feet, or upwards, with leaves about thirty inches long, and two inches broad. The flowers are in large but somewhat contracted terminal panicles. The seeds are roundish and somewhat compressed, of a reddish colour, about the size of hemp seed, and closely enveloped in the chaff.

Durra is probably the millet mentioned in the Bible, although it is not impossible that the Hebrew word might have an extent of signification similar to that of our English one. At present it is extensively cultivated in Palestine, Syria, Egypt, Nubia, and the central parts of Africa. It affords the principal food of the poorer classes in some of these countries. In Egypt three harvests of durra are obtained from the same ground in one year; in other countries where it is cultivated, generally two. In Nubia and other very warm regions it attains a height of sixteen or even twenty feet. In many parts of Africa it is the principal crop. It is used either for making bread, or like rice. In Arabia the bread made from durra is prepared by kneading the meal with camel's milk, oil, butter, or grease, and, as usually prepared, is very coarse. Wilkinson found evidence in the monuments of Egypt of the cultivation of durra by the Egyptians in very remote times.

Durra is often reaped by cutting off the ripe panicles, and leaving the stalks on the field. With proper care, the grain can be kept long uninjured. Like other kinds of grain, it is sometimes employed for the making of a fermented liquor, from which a kind of spirit is obtained by distillation.

Very similar to the grain just noticed, and perhaps a mere variety of it, is *Andropogon bicolor* (formerly called *Sorghum bicolor* and *Holcus bicolor*), which also often receives the names of Durra and Indian millet. It has larger and rounder seeds, of a white colour, with a black umbilical spot. It requires a very warm climate.

Caffre Corn (*Andropogon Caffrorum* or *Sorghum Caffrorum*) is another species, having a very diffuse umbel-like panicle, with branches bending down all around. The culm is more than the height of a man, and has a sweet pith. This grain is largely cultivated in South Africa, both by Caffres and by colonists, although by the latter it is chiefly used for feeding horses.

Another species of the same genus (*Andropogon* *saccharatus*, formerly called *Sorghum saccharatum* and *Holcus saccharatus*) is called Shaloo in India, and is there cultivated for its grain. Another use of this plant, the Sugar Grass of China, will demand notice in a future chapter. It is now cultivated to a considerable and rapidly increasing extent in North America, on account of the sugar which it yields. It has broad leaves for a grass, a loose panicle, and seeds of a yellowish colour, rather larger than those of durra. The grain has been imported to a small extent into Britain, and used like rice.

Pennisetum distichum is a grass which abounds in Central Africa, on the southern borders of the Great Desert, where it is called *Uzak*. It is described by Barth as causing much inconvenience by its bristly seeds, which lay hold of clothes like burs, the bristles also pricking the skin and producing sores, so that even the wild roving natives are under the necessity of always carrying pincers for their extraction. The grain, however, is used for food, and for making a kind of beer.

Milium nigricans is the *Maize de Guinca* of Peru. The seeds, which are very small, are dried by heat, and made into a very white flour, which is a pleasant article of food. A beverage called *ullpu* is also made from them. A nearly allied species, *Milium effusum*, is the *Millet Grass* of Britain, found in shady woods, although somewhat rare. Its seeds are an excellent food for game, and the sowing of it has been recommended on this account.

Teff (*Poa Abyssinica*), a corn plant of Abyssinia, belongs to a genus well known throughout all the northern temperate parts of the world, and of which many species, known by the common name of *Meadow Grass*, are amongst the most abundant grasses of our meadows and pastures. It has a loose spreading panicle, with capillary branches; the spikelets long and narrow, containing four or

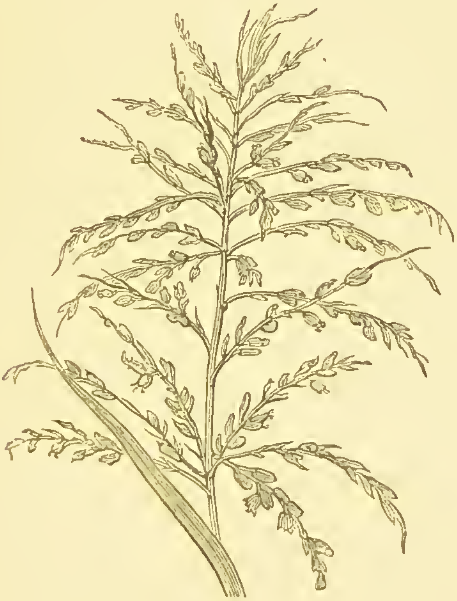

FIG. 6.—TEFF.

five florets; the culm branching and procumbent. It yields a very great amount of herbage; but the climate of Britain is not warm enough for its cultivation even as a forage plant. The grain is used in Abyssinia for making bread. Beer is made by putting slices of this bread into warm water, the temperature of which is kept up for some days.

Tocusso (*Eleusine tocusso*) is another Abyssinian corn plant, not, however, extensively cultivated. Nearly allied to it, and belonging to the same genus, is the Mand (*Eleusine corocana*) of India, known also as *Nagla Ragee* and *Natchnee.* It has a compressed erect culm, and spikes growing together in a digitate manner, the spikelets containing about four awnless florets. It is the *Murwa* of Tibet, and is more cultivated there than in any other part of the world. The Tibetans make from it a weak kind of beer much in use among them. *Eleusine stricta* is another species of the same genus, also cultivated in Tibet and the north of India. Both species are extremely productive.

Job's Tears (*Coix lachryma*) is another of the corn plants of India. The appearance of the crop is very ragged, and the produce is small. This grain is cultivated on poor soils. The spikelets are produced in clusters arising from the axils of the leaves. The seeds are white and shining, and the curious name has reference to their appearance and form.

Canary Grass (*Phalaris Canariensis*) may be reckoned among the cereal grasses, being cultivated in its native country, the Canary Islands, for the sake of the nutritious flour which it yields. This grass is almost naturalized in some parts of Britain. In the south of England, and particularly in Essex, it is cultivated to a considerable extent; but merely because of the demand for its seed—*Canary seed*—as food for cage birds. It is a very beautiful grass with an awnless panicle, contracted so as to resemble an ovate spike, and boat-shaped glumes, which are marked with green stripes. Canary grass requires a very rich soil. It is sown early, and reaped later than the ordinary grain crops. The produce in England is said to be about equal to that of wheat, but is more uncertain.

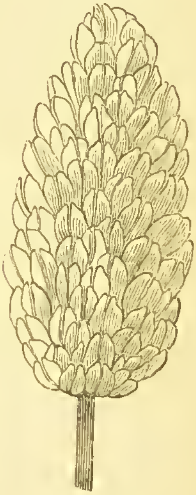

FIG. 7.—CANARY GRASS.

The seeds of the Sea Lyme Grass (*Elymus arenarius*) are made into bread in Iceland. The plant is not cultivated, but grows wild in some parts of the country, where it is carefully reaped. The bread made from it is regarded as a luxury.

On the sandy sea-shores of Britain this grass is common; and it is one of those which by their creeping roots preserve level shores from the encroachments of the sea, by binding together the loose sand, which thus also is prevented from being blown by the winds over inland fields. It has glaucous (sea-green) sharp-pointed leaves, remarkable for their strength and firmness of texture, culms about three or four feet high, and a close, erect, awnless spike of four to six inches in length.

Manna Grass (*Glyceria fluitans*, formerly *Poa fluitans*) is a grass closely allied to those commonly known as Meadow Grass. It is sometimes called *Floating Sweet Meadow Grass*, and sometimes *Flote Fescue.* It is plentiful in marshes, ditches, and by the margin of stagnant pools in Britain, and generally in the northern temperate parts of the world. It is also found in Australia. It is from one foot to three feet in height, and has a long, slender, nearly erect panicle, with slender, cylindrical, awnless spikelets, an inch long, or nearly so, which contain from seven to twenty florets. The stems are decumbent at the base, and rooting at the points; the leaves long and rather broad, the lower ones often floating. Manna Grass is a perennial, and is useful in meadows and other very wet grounds as affording food for cattle. But it is also of some value for its seeds, which are collected in Germany and Poland by spreading a cloth under the panicles and shaking them. They are used in soups and gruels, and are known in shops as *Polish Manna*, *Manna Seeds*, and *Manna Croup*. This kind of grain is so expensive that it is only used as a kind of luxury.

CHAPTER X.

OTHER FARINACEOUS SEEDS USED IN THE SAME MANNER AS GRAIN.

THERE are a few plants, belonging to various natural orders—all exogenous—which are cultivated like the cereal grasses for their farinaceous seeds, and are therefore often reckoned amongst corn plants. Of these the most important and most extensively cultivated is BUCKWHEAT. There are several species of buckwheat, all belonging to the genus *Fagopyrum*, a genus of the natural order *Polygonaceæ*, and very closely allied to the genus *Polygonum*, in which, until recently, its species were included. The genus *Polygonum* contains some of our most common weeds, as the different kinds of *Persicaria*, and the plant called Knot Grass. None of the species of *Fagopyrum* can be reckoned truly indigenous in Britain, although the most common one (*F. escu-*

lentum, formerly known as *Polygonum fagopyrum*) is sometimes to be found naturalized about farm-yards and in cultivated ground. It is supposed to be a native of Central Asia. It is an annual plant, with erect herbaceous stem, generally, in a cultivated state, from thirty inches to three feet in height; arrow-headed, sharp-pointed leaves, which are somewhat heart-shaped at the base, and spreading corymbose racemes of flowers, both at the top of the stem and on the branches. The stem and leaves have generally more or less of a reddish hue; the flowers are of a pale red or purplish colour, and although they are small, their great number gives considerable beauty to the plant. They are much sought after by bees for the honey which they yield, and bee-hives cannot be more advantageously placed than in the neighbourhood of fields of buckwheat. The herbage is very soft and succulent; very acceptable to cattle when it is young, and very abundant, so that the seed is sometimes sown thick, and the herbage ploughed down as a manure. The seed is a small nut, not so large as a grain of wheat, and of a triangular

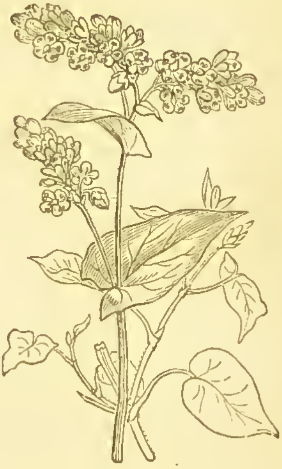

FIG. 8.—BUCKWHEAT.

form, the outer covering membranaceous, and of a brownish black colour, the kernel or farinaceous part white.

The name Buckwheat is supposed to be derived from the German *Buchweizen*, which signifies *Beech-wheat*, and thus probably has reference to the resemblance which the seed has in form to the nut or *mast* of the beech. Each flower produces one seed. Buckwheat is very productive. It begins to flower when only a few inches high, and continues to produce fresh flowers until it must be cut down, because of the ripeness of the principal part of the crop. It is best suited to light and dry soil, and is cultivated with great success where almost any kind of true corn would yield a poor return. It is a frequent crop in most of the middle parts of Europe, and in the United States of North America, where a kind of hasty-pudding made of the meal is a common and much esteemed article of food. Bread is also made of it, which is very pleasant and easy of digestion. The seed, stripped of its husk, contains no less than 52 or 53 parts of starch, besides about 27 of fibre and 10 of gluten. Besides affording food for man, buckwheat is much used for feeding horses, pigs, and poultry, and it is sometimes used, especially at Dantzig, for making ardent spirits. Its cultivation has been often recommended in Britain, but has never prevailed to any considerable extent, notwithstanding its fitness for certain kinds of poor soil, and the brief season which it requires,—the seed not being sown sooner than the beginning of May, and the crop being reaped early in autumn. Patches of it are often sown in preserves, to afford food for pheasants.

Tartarian buckwheat (*Fagopyrum Tartaricum*), supposed to be a native of Tartary, is taller and more slender than the common kind; but it is more hardy, and is therefore preferred in some situations. It is cultivated to a considerable extent in Switzerland and in Siberia. Its chief botanical distinction from the common species is in the toothed edges of the seeds, which are also of a more oblong form. Notch-seeded buckwheat (*F. emarginatum*) is said to be a native of China and Nepaul. It is not found so productive in Britain as the common kind, perhaps because the climate does not suit it, but the seeds are much larger. The distinctive character is found in the edges of the seeds, which are somewhat winged, and notched or emarginate towards the apex.

A plant nearly allied to buckwheat, but with a twining stem, and lateral leafy spikes of small greenish flowers—*Polygonum convolvulus*—is a very common weed in our gardens and corn-fields, climbing on stalks of corn, pea-stakes, and the like. Its small black triangular seeds are very often to be found amongst oatmeal; and almost every one who has eaten oatmeal porridge must recollect to have found them in that dish. The small black seeds are in quality very similar to buckwheat, although the plant seems to be of no economical value.

Next to buckwheat among the plants cultivated like the cereal grasses for their farinaceous seeds, Quinoa (*Chenopodium quinoa*) must be named. It belongs to the natural order *Chenopodiaceæ*, and to a genus of which some British species are well known by the name of goosefoot. The leaves of some of them are used like spinach; and in this way the young leaves of quinoa are sometimes used. But in Peru and Mexico, of which countries it is a native, it is cultivated for the sake of its seeds, and yields an important part of their food supplies. It appears to have been long cultivated by the Indians of these countries, although it did not soon receive that attention from Europeans which was at once bestowed upon maize. One variety grows only to the height of about four feet, another to eight feet or more. The plant is annual. The stem is erect and stout, with many angular branches; the leaves are ovate and angulately toothed, somewhat succulent; the flowers small, and of no beauty, in much branched crowded panicles; the seeds—of which only one is produced by each flower—are about one-tenth of an inch in diameter, roundish, flattened, and somewhat like millet. Quinoa is cultivated at such elevations on the mountains of Peru and Mexico that it was expected to succeed well in the middle parts of Europe and in Britain, which indeed it has been found to do; but owing to a peculiar taste which the meal has, it is not generally relished. Being very productive, however, and the seed very nutritious, it might probably be cultivated with advantage for feeding horses and poultry, which are very fond of it. In Peru and Mexico the seeds of quinoa are much used, both as we use rice and for making bread.

The seeds of Water Lilies, under which designation are included all plants of the natural order *Nymphæaceæ*, are in general wholesome and nutritious. They have a pleasant taste, not unlike that of sweet almonds, and are collected by the natives of many countries, and used either in a raw state or boiled. They contain much starch. The seeds of the magnificent *Victoria regia*, the greatest of water lilies—for the cultivation of which special hothouses have been erected in some gardens in Britain—are used for food in its native country, Guiana. The seeds of the blue water lily or lotus of the Nile (*Nymphæa lotus*) have long been a well-known article of food. Those of *Euryale ferox* are much used by the inhabitants of the Himalaya mountains, in the lakes and ponds of which the plant abounds.

Along with these must be noticed the *Marron d'Eau*, or water chestnut of the French (*Trapa natans*), a plant of the natural order *Haloragaceæ*, with horned fruit and almond-like eatable kernels. It is the only European species of the genus *Trapa* —an aquatic plant, with rhomboidal floating leaves —common in some parts of the continent of Europe, but not found in Britain. It is said to have furnished a large part of the food of the ancient Thracians. Another species of the same genus (*T. bispinosa*), called the *Singhara nut*, is of great importance to the inhabitants of Cashmere, and a tax upon the produce of the Lake of Poller is said to have yielded an annual revenue of £12,000 to Runjeet Singh. A third species (*T. bicornis*) affords no inconsiderable supply of food to the Chinese, by whom aquatic plants are cultivated more than by any other people. All these species very closely resemble each other. Their cultivation is little practised except in China, although where they naturally grow in abundance the seeds are gathered.

Many nuts, the produce of trees and shrubs, are very nutritious; but the chestnut and the cocoa-nut are almost the only kinds which can be regarded as staple articles of food to any large number of the human race. They will be noticed in a subsequent chapter.

CHAPTER XI.

THE POTATO.

THE Potato (*Solanum tuberosum*) is, perhaps, with regard to the supply of human food, next in importance to the corn plants. A native of steep, rocky places in Chili, and perhaps in other parts of South America, it is now largely cultivated in all but the very warmest and the very coldest regions of the globe. Although incapable of withstanding even the frosts of Britain, it has become one of the most important crops where the winters are much more severe; its tubers, the part of which use is made as an article of food, affording the means both of its preservation during winter, and of its propagation where the climate is such that it cannot ripen its seed. Tubers are not so readily affected by frost as the parts of a plant in which vegetation is active; they are also easily protected by artificial means; and even without these, find a natural protection in the soil itself, and in the snow which covers it. In tubers and bulbs we not only behold an admirable display of the Creator's wisdom as to the plant itself, and the requirements of its life, but also of goodness as to the wants of man.

The potato belongs to a natural order, *Solanaceæ*, and to a genus in which poisonous qualities are very strongly developed. To this order belong the plants known by the name of nightshade, one of which, the deadly nightshade (*Atropa belladonna*), is well known for its poisonous properties, and for its use in medicine; also henbane, the thorn-apple or stramonium, the mandrake, and tobacco. The potato is by no means an exception to the general character of the order. Its leaves are narcotic, as are also its berries; nor are the skin and juice of the tubers free from the same quality. The water in which potatoes have been boiled is neither pleasant nor wholesome. Yet the tubers, freed from their juice, are starchy and bland, and everything unwholesome is removed by boiling.

The potato is a perennial plant, with branching succulent stems about two or three feet in height, the branches long and weak, the leaves interruptedly pinnate and rather large, the whole herbage thick and coarse; but the flowers, which are white or tinged with purple, possessing considerable beauty, so that a field of potatoes in the flowering season presents a gay and pleasing appearance.

The congeners of the potato are very numerous, natives of tropical and subtropical countries, a few only being found in colder regions. Some of them are shrubs; others, like the potato, herbaceous; and some of these are annuals. The berries of some are eatable, as those of the egg plant (*Solanum melongena*), the kangaroo apple (*S. laciniatum*), and others to be afterwards noticed. But the potato alone, of all the species yet known, produces esculent tubers. Britain has two native species of *Solanum*, of which one, the common black nightshade or garden nightshade (*S. nigrum*), is an annual, with slightly narcotic properties, and the other, the bitter-sweet (*S. dulcamara*), is a climbing shrub, with gay corymbs of red berries, very narcotic and dangerous.

The potato appears to have been carried from South America to Spain before the middle of the sixteenth century; but it attracted little attention in Europe till long afterwards. In the end of the sixteenth century it was brought from Virginia by Sir Walter Raleigh, or some of the adventurers who accompanied him in his expedition to that country. To Raleigh's connection with Ireland is probably to be attributed its introduction into that island about this date. Its cultivation certainly began to make progress in Ireland sooner than in England, or in any other European country; and from Ireland it extended into Lancashire, the first part of England in which it became prevalent. Books on gardening, published about the end of the seventeenth and beginning of the eighteenth century, either make no mention of the potato, or mention it very briefly and slightingly. Ray, in his *Historia Plantarum*, which he began to publish in 1686, says little more about it than that it is dressed after the manner of the Spanish *batatas*, the sweet potato, which is commonly meant by the name potato in works of the seventeenth century. The name Virginian potato was sometimes used for distinction's sake. In a work published in 1687, it is suggested that the potato might perhaps be of use for feeding cattle. 'I do not hear,' says the author, 'that it has been yet essayed whether they may not be propagated in great quantities for the use of swine and other cattle.' Yet about this date we find it admitted that 'potatoes are much used in Ireland and America as bread, and may be propagated with advantage to poor people.' Notice has already been taken of the recommendation of the potato to the Royal Society by Mr. Buckland, in 1663, as suitable for general cultivation in order to the prevention of famine, which drew the attention of that Society to the subject, and led to a zealous effort with little immediate success. Ignorance of the proper mode of cultivation, and of the way of preparing the tubers for use, were probably the chief causes of the long-continued disregard of this most valuable plant.

In Scotland the potato began to be cultivated about the end of the seventeenth or the beginning of the eighteenth century, but only to a very small extent. About the year 1728, Thomas Prentice, a labourer at Kilsyth, devoted his garden to the cultivation of the potato, which, as it became known, became more and more esteemed among his neighbours, so that in a few years he succeeded in realizing from his little garden what to him was a large fortune, the sum of £200. But in most parts of Scotland the potato was little known even after the middle of last century. A few potatoes were grown in gardens, and they were used as an occasional luxury, being prepared, not by boiling, but by roasting amongst hot ashes. Children received a potato with permission to roast it, as they might receive an apple, an orange, or other fruit. It was only towards the end of last century that the cultivation of the potato became general both in England and Scotland. When we consider how many acres are devoted to this crop now, and how important it is, we cannot think without astonishment how few fields were occupied with potatoes 100 years ago.

In some parts of the continent of Europe the cultivation of the potato became pretty general at an earlier period than in Britain. This was especially the case in Switzerland and in Sweden.

In Britain, the greatest attention has been bestowed on the potato in Lancashire as a garden crop, and there the greatest number of new, and especially of early varieties, has been produced. Many of these varieties are utterly unfit for any purpose but that of supplying the table in early summer with the esteemed delicacy of *new potatoes*. In size, in productiveness, and in the mealy or amylaceous (starchy) character of the tuber, the later kinds are in general very superior.

The number of varieties now in cultivation is very large, and new ones are continually presented to public attention. The recent, and still in some measure continued, prevalence of the *potato disease*, has given new importance to the production of new varieties. It would seem that, in the case of the potato, as of other cultivated plants, no variety can be regarded as long permanent, and however excellent, it must soon give place to others. The improvements which have resulted from cultivation are only to be maintained by means somewhat similar to those from which they originated. But a constant succession of new varieties is especially necessary, when, as in the case of the potato, an esteemed variety is not in general propagated by seed.

It is not necessary here to describe the ordinary manner of the cultivation of the potato. Nor is it necessary to say much of the potato disease, the ravages of which were attended with such fearful consequences in Ireland and elsewhere, in 1846 and subsequent years. The potato disease is probably caused by a small fungus, although the whole subject is involved in uncertainty.

Besides the use of potatoes for the table, and the consumpt of great quantities of them for the feeding of cattle, they are largely used for the manufacture of *potato starch*, which is prepared by reducing the tubers to a pulp, and washing with water; the starch, which is insoluble in cold water, settling to the bottom, white and pure. In some places this manufacture is carried on upon an extensive scale, and the starch thus obtained is often fraudulently substituted for or mixed with arrowroot, which it resembles, but to which it is decidedly inferior. A mode has been discovered of converting the starch of potatoes into sugar, and is employed in some parts of the continent of Europe in manufactories established for that purpose. Great difficulty is, indeed, found in obtaining a crystallized sugar; but a sweet syrup, useful for many purposes, is easily made. Ardent spirits can also be easily made from potatoes; and a liquor thus produced is in common use in Norway.

CHAPTER XII.

YAMS.

WHAT the potato is to the inhabitants of temperate countries, the different kinds of yams in some measure are to those of tropical regions. The Yam is a plant very different in appearance and in botanical characters from the potato, but agrees with it more than almost any other known plant in the properties of its tubers.

Yams are species of the genus *Dioscorea*, which belongs to the natural order *Dioscoreacæ*, an order which contains no British plant except the Black Briony (*Tamus communis*), a native of hedges and thickets in some parts of England, but not found in Scotland. The order is, indeed, almost exclusively tropical, and consists of twining plants, more or less shrubby, with great fleshy tubers either above or below ground. These tubers, however, are very often, as in the black briony, extremely acrid. The leaves are broad, and have reticulated veins. The flowers are small, spiked, and unisexual, the fruit a leaf-like three-celled capsuli.

The Common Yam (*Dioscorea sativa*) is by some regarded as a native of tropical America, and by others of the East Indies. It is not improbable that, like many other cultivated plants, it has been much modified by cultivation, and that it is to be referred to some original species considerably different. It is destitute of the prickles which are found on some of its congeners ; and has alternate smooth leaves, heart-shaped, and nearly as broad as they are long, with about nine ribs, and terminating in a point. The stems are tender, and about eighteen or twenty feet in height. The tuber is generally of a flat, palmate form, about a foot in breath, its skin dark brown or almost black, its flesh white. The yam is planted and cultivated much in the same manner as the potato, but stakes must be provided for the climbing stems, and the crop occupies the ground for nine or ten months.

The Winged Yam (*Dioscorea alata*) is also very generally cultivated. Its roots are larger than those of the common kind, often weighing about thirty pounds.

In some species of this genus, the acrid principle which prevails in the order is so strongly developed even in the tubers, that they are utterly unfit for use.

Those of *Dioscorea triphylla* and *D. daemona* are described as 'dreadfully nauseous.'

The tubers of yams are capable of being long preserved in a condition fit for use, if packed in sand and kept dry. In this way they are sometimes imported into Britain, but merely as an article of curiosity. The making of starch from yams has never been prosecuted on an extensive scale, although this might probably become an important product of tropical countries.

At the time of the famine consequent upon the failure of the potato crop, 1846–1847, an attempt was made to cultivate the yam in Ireland; but it totally failed, the climate being too cold. More recently, however, a new species, *Dioscorea batatas*, has been introduced from China, where it has long been cultivated in districts of temperate climate. This species has produced tubers of good size in the neighbourhood of Paris, and hopes are entertained that it may prove a valuable acquisition not only to the south and middle of Europe, but even to Britain. It is hardy enough to endure the climate even of the north of Scotland, not suffering from frosts so readily as the potato; but the heat of summer does not seem to be sufficiently great and long-continued for its luxuriant growth, and for the enlargement of the tubers to such a size as to make them worthy of regard.

CHAPTER XIII.

OTHER ESCULENT TUBERS.

THE number of esculent tubers is very considerable, although there are no others to be compared in importance with the potato and the yam. Perhaps some, however, are deserving of more attention than they have yet received. There is nothing in plants which might better be expected to prove available for man than these stores of amylaceous matter existing in the tubers of many species extremely different in their botanical characters and affinities.

Except the potato, no tuber is so well known in Britain as the Jerusalem Artichoke (*Helianthus tuberosus*). The English name of this plant is of curious origin. The latter part of it is derived from a supposed resemblance in the taste of the tuber to that of the receptacle of the flowers of the artichoke—the part of that plant which is used for the table; whilst *Jerusalem* is in this name a mere corruption of *Girasole*, the Italian for sunflower. The plant is indeed a sunflower, and very nearly allied to the great yellow sunflower so well known in our gardens, one of the coarsest of gaudy annuals. The Jerusalem artichoke is a perennial, with a straight, erect stem, from ten to twelve feet in height, rough serrated leaves,—the lower ones heart-shaped, the upper ones ovato-lanceolate,—the heads of flowers similar to those of the common sunflower, but smaller. It is a native of Brazil, and seldom produces flowers in Britain, although very easy of cultivation, being propagated in the same manner as the potato by cuttings of its tubers. The tubers are not in general so large as the largest kinds of potato, but are plentifully produced. They are mostly clustered together, close under the stem. They are cooked in various ways; but are more watery than potatoes, and contain less amylaceous matter. In some parts of Europe this plant is much more extensively cultivated than in Britain, both leaves and tubers being much used for feeding cattle; whilst in districts where fuel is scarce, the dried stalks are found very useful, and indeed nothing can be better for making a quick blaze, or kindling a fire. The Jerusalem artichoke succeeds very well on poor soils, and under trees, where few other plants would grow.

The Batata or Sweet Potato (*Batatas edulis*) is a native of the East Indies, but now commonly cultivated in almost all tropical and subtropical countries. As, unlike the yam, it requires only a brief time for its growth, its cultivation extends far into the temperate zone in those regions, as the United States of North America, in which the summer is very hot. It was introduced into England about the middle of the sixteenth century, but was soon found unsuitable for the climate. The tubers were at one time imported in considerable quantities from Spain and the Canaries as an article of luxury, but their importation has ceased. The sweet potato is a plant of the natural order *Convolvulaceæ,* and, indeed, was until recently included in the great genus *Convolvulus,* along with some well-known British plants and familiar ornaments of our flower borders. It is a herbaceous perennial, with a number of trailing stems, six or eight feet in length, rooting at each node, and in warm climates soon forming tubers there. The leaves are heart-shaped, angular, and stalked; the flowers large and purple, three or four growing together. The tubers are often very large. They are sweet and nutritious, although in the natural order *Convolvulaceæ* very different qualities generally prevail, purgative resins being often produced, which furnish us with jalap, scammony, and other medicines. Few plants are more easily cultivated or require less attention than the sweet potato, and almost none is more easily propagated, small portions of the stem taking root quite freely in warm climates. In the neighbourhood of Paris it is cultivated by planting out from a hotbed in the end of spring; in Britain it must be retained in the hotbed. A congener of the sweet potato, known as *Batatas jalapa*, in consequence of a mistaken notion that its root yielded jalap, and formerly called *Ipomœa macrorhiza*, grows in sandy soils in Carolina and Georgia, and has insipid farinaceous tubers of 40 to 50 pounds weight. It is not improbable that it may yet prove of some value.

Several species of *Oxalis* have tuberous roots, which, although not so farinaceous as the potato or yam, are in some countries used in the same manner. This is the genus to which the Wood Sorrel (*O. acetosella*) belongs—one of the most familiar of British plants, and a fine ornament of our woods. Most of the species have trifoliate leaves like the wood sorrel, and are characterized by the same prevalent acidity. The leaves of some, as *O. crenata*, are very acid, and are used for making tarts, like rhubarb, or an agreeable preserve. This is one of the species with esculent tubers. It is a native of mountainous regions of South America, and is cultivated in Peru both for its tubers and its foliage. It there bears the name of Oca. It is capable of being cultivated in the open air in Britain, and from each plant may be obtained about half a pound of tubers, of the average weight of about two ounces. Even the tubers of this plant are extremely acid, and they retain their acidity after being cooked; but exposure to light and air has the effect of changing their qualities, so that they become a sweet and wholesome food. *O. Deppei*, another South American species, has fleshy roots as large as parsnips, which have begun to be esteemed for culinary purposes, and the plant is now occasionally cultivated in our gardens. *O. crassicaulis* and *O. esculenta*, also South American, have roots possessing similar good qualities. *O. tetraphylla*, a native of Mexico, a stemless species, with four leaflets in each leaf, has large fusiform roots, with scaly bulbs attached to their crown. Its roots are a pleasant esculent, and it is quite hardy in Britain. The small bulbs are used like the roots, or for pickles, and by means of them the plant is easily propagated.

Melloco (*Mellocus tuberosus*, or *Ullucus tuberosus*) is another native of the mountainous parts of Peru, having tuberous roots, which have been recommended as a substitute for the potato. It is cultivated in its native country. The roots are amylaceous and mucilaginous. The leaves are kidney-shaped, heart-shaped at the base, and somewhat fleshy, like those of purslane or New Zealand spinach, with which the plant is more nearly allied than with any other well-known plant, and are used after the manner of spinach.

The mountains of Peru and of the neighbouring parts of South America seem to be peculiarly rich in plants producing esculent tubers. A species of Indian cress (*Tropæolum tuberosum*), with brilliant orange blossoms, and leaves very much like those of the common Indian cress (*T. majus*) of our gardens, is another of the Peruvian esculents. In Britain the plant is tender, and the tubers scarcely reach their proper maturity. The tubers produced in such circumstances are soft and waxy, with something of the pungency which belongs to the leaves of the Indian cress. When fully matured, they are more amylaceous, and of very superior quality. In Peru they are valued as an article of food ; and the plant possesses what in some countries must be a great recommendation—the power of withstanding excessive droughts.

The same regions produce also the *Alstrœmeria ovata* and *A. pallida*, two species of a genus well known in our flower gardens, and of which some of the species rival the finest lilies in the beauty of their flowers. In Chili, the tubers which are mixed with the fibrous roots of these plants are cooked, and used for food.

It is to be observed that these South American tuberous-rooted plants belong to very different natural orders. The *Alstrœmerias* are endogenous, the others all exogenous.

Some leguminous plants produce esculent tubers. *Lathyrus tuberosus* is of the same genus with the vetchlings of our woods and hedges. It is a native of the continent of Europe, although not of Britain; and in some countries, particularly in Holland, it is cultivated for the sake of its tubers, which are numerous, irregularly shaped, and of a blackish colour. Their taste, when cooked, somewhat resembles that of roasted chestnuts. They are sometimes called *Dutch Mice* and *Earth Mice.*

The roots of *Apios tuberosa*, or *Glycine apios*, are used as an article of food in the warm parts of America. *Dolichos tuberosus* and *D. bulbosus* are natives of the West Indies, of a genus very nearly allied to *Phaseolus*, of which the scarlet runner and kidney bean are familiar examples. Their roots are used for food.

Some of the *Cyperaceæ*, the natural order to which sedges and bulrushes belong, produce tubers; and *Cyperus esculentus*, a native of the south of Europe, is cultivated for their sake. The tubers are, indeed, little larger than peas, and are used rather as a delicacy than as a substantive article of food. They are eaten either raw or boiled, and have a sweetish, nut-like taste. They are also employed in the preparation of *Orgeat*. The cultivation of this plant extends as far north as the middle of Germany, but is scarcely attempted in Britain. It succeeds best in moist soils. A more valuable plant of the same order is the *Pi-tsi* of the Chinese, *Scirpus tuberosus*, which is much cultivated in China for the sake of its tubers.

There are many other tuberous-rooted plants, of which the tubers are used for food, and some of which are cultivated, although only to a small extent. The earth-nut (*Bunium bulbocastanum*) is an umbelliferous plant, the tubers of which are much used in Sweden and other parts of the north of Europe, although disregarded in Britain. The English name, pig-nut, indicates the fondness of pigs for this tuber, in quest of which they grub up the soil wherever it is to be found. The tubers of an allied species, *Bunium ferulaceum*, are eaten in Greece.

Clytonia tuberosa is a plant somewhat akin to purslane, of which the tubers are eaten in Siberia.

An important place among esculent tubers must be assigned to those of some species of *Tacca*, particularly *T. pinnatifida*, *T. montana*, and *T. dubia*. They are large herbaceous plants, somewhat resembling *Arums*, with leaves all springing from the crown of the root; the leaves in some kinds entire, in others divided; the flowers in umbels at the top of an unbranching flower-stem. They are natives of maritime places and woods in India, the South Sea Islands, and Africa. They are cultivated in the South Sea Islands, China, Cochin-China, and other countries, and the tubers are used as an article of food, although they have a disagreeable acridity. When they are steeped and macerated in water for some days, however, a starch is obtained which is quite free from acridity, and which is made into cakes or puddings.

CHAPTER XIV.

PULSE.

THE seeds of some leguminous plants, as peas, beans, and lentiles, are common articles of food, and are known by the generic name of *Pulse.* The leguminous plants producing edible seeds belong to the sub-order of leguminous plants having *papilionaceous* flowers. The flowers thus designated are remarkable for the structure of their corolla, which is very different from that of any flowers of other orders, but of which familiar examples occur in the pea, bean, broom, furze, and laburnum. All kinds of pulse differ from grain in being less farinaceous ; starch existing in them in a smaller proportion, whilst gluten does not at all appear ; but instead of it all of them contain a considerable quantity of a nitrogenous substance called *legumin,* which is almost identical in composition and properties with the *caseine* of milk, a fact which enables us to under-stand how the Chinese make cheese from peas. In the most common and valuable kinds of pulse, legumin is present to the amount of almost 25 per cent. The seeds of many leguminous plants, however, contain also narcotic or other poisonous substances in very notable quantity; and almost every one must be familiar with the bitter and repulsive taste which some of them possess. The seeds of the bean, when fully ripe, are not entirely free from narcotic properties, although these are in part removed by boiling; and those of *Lathyrus aphaca* are very narcotic when ripe, although in a green state they are eaten along with their pods, and found wholesome and agreeable. Another species of Lathyrus (*L. cicera*) is a pest in the corn-fields of some parts of Europe, its narcotic seeds spoiling the flour and rendering it unwholesome. The most important kinds of pulse require more particular notice.

CHAPTER XV.

THE PEA.

THE Pea (*Pisum sativum*) belongs to a genus of which there are very few species, but which differs very slightly from *Lathyrus*, a genus containing many species, some of them common in British woods, and others frequent in our flower-gardens. The pea has been cultivated from a very early period, and, as in the case of many long-cultivated plants, its native country is not certainly known. The probability, however, appears to be that all the kinds in cultivation are derived from a common wild plant of Greece and other more eastern regions, to which the grey field pea, well known to farmers, has a very near resemblance; and this kind, it is observed, retains its characters in all ordinary circumstances, whilst the other more improved varieties continually show a tendency to degenerate, and require a much greater amount of care on the part of the cultivator. A vain attempt has been made by some botanists to distinguish the cultivated field pea (which they call *Pisum arvense*) from the garden pea (*P. sativum*). No probable reason can be shown for regarding them as really distinct species.

The pea, as is well known, is an annual plant, climbing by tendrils which rise from the termination of pinnate leaves that have only a single pair of ovate leaflets. The stem divides into branches. Some of the varieties are much more branching than others. Every one is familiar with the method of supporting peas in gardens, by means of branches of trees used as stakes, or of strings stretched from one stake to another; and beans and peas are sometimes sown together in fields, that the weaker plant may be supported by the stronger. Few kinds of field peas are very tall, but some of the garden kinds attain a height of seven or eight feet; many, however, are only three or four feet in height, and some are of very dwarf habit. The dwarf kinds are preferred for forcing in hothouses, or where branches cannot easily be obtained for staking. Rows of peas are rather unpleasing to the eye when the flowering is over, and the haulm begins to be torn down by careless gatherers; but the plant itself is a beautiful one, and its bright green leaves and large white flowers make it as worthy of the flower-garden as many plants commonly cultivated there. Some varieties of peas have red flowers, and these are common in field culture ; but the redness of the flower is always associated not only with a darkness of colour in the seed, but also with a rankness of flavour, so that the white-flowering kinds are always preferred for culinary use.

The flowers, and consequently the pods of peas, are generally produced in pairs, but sometimes singly, and in a few varieties all the blossoms are congregated near the extremity of the branches so as to form clusters. The pods vary in size, in form, and in the number of seeds which they contain. In some varieties they are straight, in others curved, in some nearly cylindrical, in others flattened. In general they are not more than two and a half or three inches long, in the smaller kinds much less ; but varieties exist with pods seven inches in length. The peas vary in number from three or five to seven or nine in the pod ; and in the different kinds vary considerably in size, and still more in colour, some being yellowish white, some bluish, others grey, yellowish white, or purplish,—these latter colours belonging to kinds that are cultivated in the field alone.

The object of the gardener being to provide a supply of *green peas* during as long a period of the year as possible, he takes care to sow at different seasons, and avails himself of the difference which exists amongst the varieties of the pea as to rapidity of growth. In some parts of the continent of Europe much use is made of certain varieties, in which the inner skin of the pod, usually very tough, is reduced to a thin film, the whole pod in an unripe state being boiled and eaten like kidney-beans. These are called *sugar peas* or *wyker peas.* Their use has never become general in Britain, although they have been known in our gardens for two hundred years.

Peas are not only employed as human food, both in a ripe and in an unripe state, but as food for cattle, for which the haulm or straw is also very nourishing. They are also ground into meal, of which large quantities are used in some countries for making a kind of porridge, well known in Scotland as *pease brose,* sometimes recommended to invalids as nutritious and easy of digestion; and for making a kind of unleavened bread, which is not generally deemed palatable by those who have not early been accustomed to it. Pease meal is also used with oilcake and other kinds of food for fattening oxen, sheep, and pigs. Before potatoes came into general use, it was more extensively employed than now for human food.

Split peas, used in the making of pea-soup, are merely peas deprived of their outer skin by a particular adjustment of millstones, the cotyledons separating one from another. It is not every kind of pea, however, which is fit for being converted into *split peas*, and so into pea-soup. Many of the field kinds are not only too rank in flavour, but they will not boil down into a pulp, as for this purpose it is requisite that they should. Particular varieties of peas, called *white peas*, are extensively cultivated in some parts of England to be used for making *split peas*.

It appears from historic documents that peas were cultivated both in England and Scotland at a very early period. The finer kinds, however, do not appear to have been known in the gardens of Britain till the 17th century. In the reign of Queen Elizabeth, they were brought from Holland as a luxury for the great.

The pea is cultivated in all parts of Europe. Even in the farthest north, wherever a garden is found, an attempt is made to produce green peas. The cultivation of the pea is also common in all the countries colonized from Europe, except those which are tropical. In subtropical countries, it is grown at the colder seasons of the year. It has long been cultivated in India, China, Cochin-China, and Japan.

The sea pea, a plant found on some parts of the shores of Britain (known to botanists as *Pisum maritimum*, or as *Lathyrus maritimus*), has more resemblance to the pea than any other British plant.

Its flower-stalks, however, are many-flowered, and its leaves have three or four pairs of leaflets. A species of pea (*Pisum ochrus*) found in the cornfields of Italy and Sicily, with yellow flowers, and one-flowered flower-stalks, is sometimes cultivated as a curiosity, but its seeds have a rank flavour ; and those of the sea pea, although not unwholesome, are not agreeable. A species of pea (*Pisum Americanum*) found at Cape Horn, afforded a most welcome variety of food to the crews of Lord Anson's ships, weary of salted provisions, and suffering from sea scurvy, and was described in enthusiastic terms, but was soon found to be very inferior to the ordinary kinds in cultivation.

CHAPTER XVI.

THE BEAN.

THE bean (*Faba vulgaris* of some botanists, *Vicia faba* of Linnæus) is believed to be a native of the East, but has nowhere been found wild by any botanist. It has been cultivated from the most remote antiquity. It is mentioned in the Old Testament, and was the *pul* of the Hebrews, from which name our English word *pulse* is supposed to be derived. It appears in the paintings of the ancient Egyptians.

The bean, although ranked as a species of Vetch (*Vicia*) by Linnæus, differs entirely from the ordinary habit of that genus in its stout upright stems and want of tendrils, and in its pod, which is tumid and spongy inside. The seeds are marked with a large scar, not on the side, but on the end.

The bean is an annual plant, the stem often dividing near the ground into two or more branches which grow erect as distinct stems; the leaves pinnate, with from two to five oval leaflets. The flowers are not so large as those of the pea. They are more or less clustered, close to the stem. They are beautiful, and in most of the varieties they are white, with a black spot on each of the wings of so perfect a blackness as is very rare in flowers; but in some varieties this black spot entirely disappears, and there is a variety with scarlet blossoms. The delicious odour of the bean flower adds in its season to the pleasure of the garden, and is enjoyed by the traveller as he passes along the dusty highway near the bean-field. It is happily noticed by Burns in one of his sweetest poems:

"'Twas e'en, the dewy fields were green,
On every blade the pearls hang;
The zephyr wanton'd round the bean,
And bore its fragrant sweets alang.'

The varieties of the bean are very numerous. They differ very much in size, some kinds being of very humble growth, and others attaining a height of five feet; the pods varying from two to six or seven inches in length, and in form being cylindrical or flattened. The seeds of the smallest kinds do not much exceed in size the largest peas, but the largest kinds of beans are more than an inch in diameter. These, however, are much flattened, whilst the smaller kinds are more rounded. There is also a considerable diversity in the number of seeds which the pods contain. It is not unusual, in some of the large garden varieties, to find pods with only one fully developed seed, two or three being the ordinary number, whilst other kinds have four or five, and some six or eight seeds.

The smaller kinds of bean are generally preferred for field culture, and are used for feeding horses and other domestic animals, or for making bean meal, which is sometimes used as an article of human food, but generally mixed with some other kind of meal. The bread made principally of bean meal, a kind of unfermented bread, if not very delicate, is certainly very nutritious. Beans were exported from Britain to the West Indies for feeding slaves in the times when slavery existed there. Garden beans are sometimes used in a ripe state as an article of food, the surplus produce of the summer being thus consumed in winter; but they are generally cultivated in order to be used in an unripe state. The haulm or straw of the bean is relished by cattle, and is a very nourishing food for them.

The bean occupies an important place in the present agricultural system of Britain. It is also extensively cultivated in almost all countries of temperate climate, and has long been cultivated in China and Japan. In Barbary it is a principal article of food, and is stewed with oil and garlic. In subtropical countries the bean is a winter crop.

CHAPTER XVII.

THE KIDNEY BEAN, SCARLET RUNNER, ETC.

THE Kidney Bean (*Phaseolus vulgaris*), the *Haricot* of the French, is believed to be a native of the East Indies. It belongs to a genus of which a distinctive character is, that the lower part of the flower, containing the organ of fructification, is spirally rolled. This peculiarity is very notable in the flower of the kidney bean. The plant is of humble growth, often about a foot in height, with a branching stem and a bushy habit. The leaves—as in all this genus, and in a large section of the *Leguminosæ*—have three leaflets, which in this species are ovato-acuminate, and have long foot-stalks. The flowers are in small axillary racemes, generally white or yellowish, partly concealed among the leaves, and of no great beauty. In this respect they differ much from those of the scarlet runner (*Ph. multiflorus*), which has been regarded by many as a mere variety of the kidney bean, but has very good claims to be accounted a distinct species. It has a somewhat tuberous root; a twining stem, often ascending to the height of eight or ten feet; leaves very similar to those of the kidney bean, but rather larger; and very beautiful scarlet flowers in stalked racemes, which are longer than the leaves. There are, however, varieties of the kidney bean in which a twining character of the stem is developed to a considerable extent, as the kinds known by the names of *White Runner* and *Turkish Pea.*

Both the kidney bean and the scarlet runner have been long known and cultivated in Britain—certainly, at least, from the sixteenth century. It is only, however, in the southernmost parts of the island that they can be advantageously cultivated for the sake of their ripened seeds, and their principal use is to afford a pleasant and wholesome dish in summer and autumn; the young pods, before their skin has become tough and hard, being much esteemed as a boiled vegetable, although their value is perhaps not so highly appreciated as it ought to be, and they are chiefly seen on the tables of the rich, whilst they might be common on those even of the poor. Few plants cultivated in our gardens yield a more abundant crop than the scarlet runner, when its green pods are used in this way; and they are nearly if not quite as tender as those of the kidney bean, although larger and of coarser appearance. They are also produced in succession during a very considerable period,—in fact, from the time when green peas begin to cease until the frosts of winter come on. An early frost destroys the plant, which in British gardens is generally treated as an annual, although it is really a perennial, differing in this respect from the kidney bean, which is a true annual. The roots of scarlet runners are sometimes preserved through the winter, and in this way a supply is obtained early in the following year. The tenderness of the plant prevents the sowing of it earlier than May, at least in the northern parts of Britain. It requires stakes as tall as those of the tallest kinds of peas. It is sometimes employed to form temporary screens or hedges, which, when covered with foliage and flowers, are very beautiful, and may be employed to hide any unsightly object. For a long time after its introduction into Britain, the scarlet runner was only cultivated as an ornamental plant, and it still keeps its place in the flower garden. Near London, however, great fields of scarlet runners may be seen, cultivated for the supply of green pods to Covent Garden market, and presenting a most magnificent appearance.

In countries a little warmer than Britain, or which have a warmer summer, both kidney beans and scarlet runners are very extensively cultivated for their ripened seeds. The dwarf bushy kinds are generally preferred for field crops, because of the greater uniformity in ripening; and no leguminous crop whatever yields so great a return. In France, the kidney bean is regarded as the next crop in importance to wheat. In the United States of America it is also extensively cultivated. The name *French beans* is very often given in Britain to the ripened seeds; and when the potato for a time almost disappeared from the table, owing to the failure of the potato crop in 1846, great quantities of kidney beans, chiefly of a small white variety, were imported, and sold under the name of *American beans.* They were generally regarded as a very inferior substitute for the potato, but probably were often insufficiently boiled, and otherwise ill cooked.

Kidney beans, in a ripe state, are more free from any peculiar flavour than common beans, peas, or almost any other kind of pulse. In those countries in which they are abundantly produced, they are used in a great variety of ways as an article of human food, and also for feeding horses and other domestic animals.

The varieties in cultivation are very numerous; and besides the differences already noticed in the general habit of the plant, they differ from each other in the shape and length of the pods, and in the size, form, and colour of the seeds. The seeds of some kinds are white, others yellow, brown, dun, black, or speckled. The pods are sometimes straight, sometimes slightly curved; sometimes rounded, sometimes much compressed; always fleshy—varying in length from two inches to six inches and upwards: in some kinds they are a foot long. The pods of some kinds contain four or five seeds, those of others a greater number. The pods of the scarlet runner are larger than those of the kidney bean, and its seeds are as large as ordinary garden beans of the middle size, but very different in shape as well as in colour; and the scar is on the side, and not at the end of the seed.

It is said that the leaves of the kidney bean are used as an esculent in Nubia. The roots of the scarlet runner are narcotic and poisonous. Dr. Lindley mentions an instance of some children being poisoned by them at Chelsea. It is not unusual to find poisonous qualities strongly developed in particular parts of plants, of which other parts are edible and wholesome The kernel of a plum differs extremely in its properties from the pulp of the fruit, and may indeed be described as poisonous. Many other examples might be adduced, at least, as remarkable.

The scarlet runner, when it was first introduced into Britain, was supposed to be a native of South America, although it is now believed to be, like the kidney bean, a native of the East

Indies. It may be mentioned, as an instance of the absurdity which sometimes finds its way into books under the show of science, that its twining from left to right, and not from right to left, as is more usual in twining plants, has been accounted for by supposing that the plant, although removed to the northern hemisphere, 'is still obedient to the course originally assigned to it, turning in a direction which, in its native climate, would be towards the sun.'

Phaseolus lunatus, another species of this genus, is sometimes called the Lima Kidney Bean, although a native of Bengal. It is an annual, with long curved pods and large seeds, which are used in the same way as those of the species already noticed. It is very productive, but too tender for the climate of Britain.

Closely allied to the genus *Phaseolus* is the genus *Dolichos*, of which some species are cultivated in warm countries, their seeds being used as those of the kidney bean, to which, however, none of them is equal in value. None of them will endure the climate of Britain. One or two of them are occasionally cultivated in the south of Europe, particularly *Dolichos unguiculatus*, a native of the West Indies.

CHAPTER XVIII.

THE LENTIL.

THE Lentil (*Ervum lens*) belongs to a genus of which two species are not uncommon in Britain as weeds of cornfields and hedge-banks. They are known by the name of Tares, and are small plants with very small flowers and pods, nutritious enough as herbage for cattle, but producing so little bulk of herbage as to be of no economical importance. In its general habit and appearance the lentil very much resembles them; and although its leaves, flowers, and pods are larger than theirs,

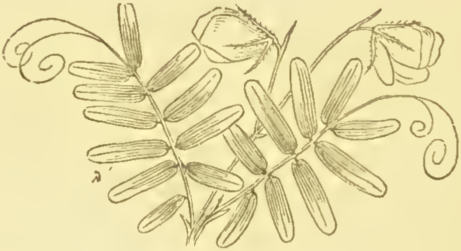

FIG. 9.—LENTILS.

they are small in comparison with those of any of the leguminous plants already noticed.

The lentil is an annual plant, a native of the south of Europe and of the East, with weak stems generally about a foot and a half in height, much branched; the leaves pinnate, with from eight to twelve leaflets, and terminated by small tendrils; the flowers generally in pairs on slender stalks, small, bluish white, and succeeded by thin pods, which in the largest varieties are about three-fourths of an inch in length, and half an inch in breadth, but in some of the most valuable kinds much smaller, each pod containing only one seed or two. The plant, however, produces a great number of pods. The seeds are of a remarkable form—'lens-shaped,' like the double convex lens used in optical instruments. In the largest varieties the seeds are about three-eighths of an inch in diameter; in the smallest, not more than one-eighth. In some varieties the seeds are of a whitish colour, in others reddish brown, or almost black, and internally of a bright red. The Red Lentil is one of the varieties most extensively cultivated, and seems to have been so from very ancient times, for the 'pottage of lentils' which Jacob gave to his brother Esau was asked as 'that *red* pottage' (Gen. xxv. 30, 34). Lentils are frequently mentioned in the Old Testament, and have long been a common crop and a principal article of food in the Levant. In many parts of Europe they are much cultivated. The plant is of very rapid growth, and soon ripens its seeds. The herbage is exceedingly nutritious to cattle, and on this account the lentil is sometimes cultivated in Britain, and pretty extensively in France. Its cultivation for its seeds has been strongly recommended in Britain, and the warmth of the climate is certainly quite sufficient, the seeds ripening early and well ; but their aptness to sprout is so great, that a few moist days do irreparable damage, and thus the crop is extremely precarious. The lentil succeeds best on light dry soils.

The *Revalenta Arabica* sold in our shops, and which has figured so much in newspaper advertisements, consists mainly of lentil flour, from which it derives all the good qualities it possesses. It is not unfrequently mixed with pease-meal and other still cheaper commodities. The price greatly exceeds that of lentil flour, and is paid merely for the name. Lentil flour, sold under its own proper name, and split lentils to be used for making soup like split peas, are now common in shops, and possess all the merits which can fairly be ascribed to Revalenta Arabica, being very nutritious, easy of digestion, and gently laxative. A mixture of a small quantity of split lentils with split peas is a great improvement to pea-soup, and makes it not only more pleasant, but more wholesome. Most people will probably esteem such a soup more agreeable than lentil-soup itself.

Besides the common lentil, another species, the One-flowered Lentil (*Ervum monanthus*), is cultivated in some parts of France under the name of *Jarosse* or *Jarulle*, both for its seeds and for its herbage, but chiefly for the latter. It is especially adapted to the very poorest sandy soils.

CHAPTER XIX.

OTHER KINDS OF PULSE.

THERE are still many other leguminous plants which require notice as being more or less extensively cultivated in different parts of the world.

Of these, one of the most important is the Chick Pea (*Cicer arietinum*), an annual plant about a foot in height, much branched, with pinnate leaves of about seven pair of oblong leaflets and a terminal one, but no tendrils,—all parts covered with glandular hairs ; the flowers growing singly or on slender stalks, much larger than those of the lentil, and of a pinkish-white colour ; the pods usually about an inch long, two-seeded, turgid, and hairy The seed is generally regarded as having some resemblance in form to a ram's head (whence the name *arietinum*, from the Latin *aries*, a ram). The chick pea is rather too tender for the climate of England, but is extensively cultivated in the south of Europe, in Egypt, Syria, Palestine, India, and many parts of the East. In India it bears the name of *Gram.* In France the seeds are much used in soups; they are the *Garavance* or *Garavanzos* of the Spaniards, an important ingredient in many of their favourite dishes; and in some eastern countries they are eaten in a parched state, and form a principal part of the provision for travellers in the desert. It seems very probable that this is the *parched corn* frequently mentioned in the Bible as a common article of food.

The American Earth-nut, or Underground Kidney Bean (*Arachis hypogæa*), is a native of the tropical parts of South America, but now extensively cultivated in the East Indies and in some of the warmest parts of Europe. It is an annual of humble growth, with pinnate leaves, which have in general only two pairs of leaflets without a terminal one, and without tendrils. It has small, solitary, yellow flowers. After flowering, the flower stalk turns downwards, elongates, and buries the pod in the soil, where it ripens. The pods are about an inch long, leathery, and usually contain two seeds about the size of small field beans, which have an agreeable nut-like flavour. They are used as an article of food, and abound in a fixed oil, similar to olive oil, which, under the name of Ground-Nut Oil, has become an important article of commerce.

Lupines were extensively cultivated by the ancient Romans for their seeds, which were used like other kinds of pulse; but, owing to their bitterness, they are very inferior to most kinds that are cultivated. Virgil therefore applies to the lupine the epithet *tristis* (*Georg.* i. 75); but he enumerates it among the leguminous crops cultivated in his time. Many of the lupines now cultivated in our flower-gardens, however, are natives of countries unknown to the ancient Romans. The white lupine (*Lupinus albus*) and the yellow lupine (*L. luteus*), natives of the south of Europe, were the kinds cultivated by them, and both species are still cultivated in Italy and other parts of the continent of Europe, not now for their seeds, which have fallen into complete disuse, but only for their herbage, as food for cattle, or to be ploughed down for green manuring.

The Chickling Vetch, or Lentil of Spain (*Lathyrus sativus*), a native of Spain and other parts of the south of Europe, is cultivated in some districts of France and elsewhere on the continent of Europe, both as a green food for cattle, and on account of its seeds. The stems are winged and trailing, three or four feet long; the leaves consist of two leaflets and a tendril; the flowers are violet-coloured and solitary in the axils of the leaves; the pods are short and broad, winged at the back, about an inch and a half long, containing generally two flattish seeds of a dun or brown colour. The seeds are used in the same way as lentils. From a belief that the use of this kind of pulse produced rigidity of the limbs, delirium, and other sad effects, the Duke of Wurtemberg, in 1671, prohibited it in his dominions, and the prohibition was confirmed and enforced by his successors. Dr. Lindley says there is no doubt that animals fed on these seeds exhibit all the symptoms of being poisoned; which may be quite true, without the seeds being even unwholesome in smaller quantities, or possessing any properties not in some measure common even to beans and peas.

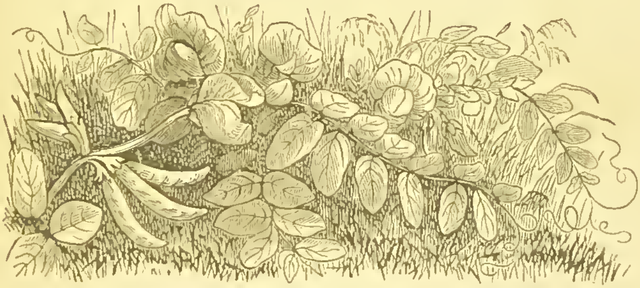

FIG. 10.—VETCHES.

The White Vetch, a variety of the Common Vetch or Tare (*Vicia sativa*), with white instead of black seeds, is cultivated in some countries, as France and Canada, for the sake of its seeds, which are used both green and ripe, in the same manner as peas. It is not so productive of herbage as the common black-seeded vetch, although it is also sometimes cultivated for its herbage. It produces, however, a greater abundance of seeds. The meal made from this seed is sometimes mixed with flour, for making a kind of unleavened bread. The vetch is a native of Britain and of the continent of Europe. The black seeds of the common variety have a rank, peculiar flavour, which is scarcely perceptible in the white kind.

The Pigeon Pea (*Cajanus flavus*) is a native of the East Indies. It is cultivated not only in its native country, but in many other tropical countries. It is a shrub about nine feet high, and is planted in rows as a fence to sugar plantations in the West Indies. The seed is much used as an article of food by the negroes, and it is a pleasant and wholesome kind of pulse. It receives the name of pigeon pea from being much used in Jamaica and elsewhere for feeding pigeons.

There are many other kinds of pulse, not of great importance, nor extensively cultivated, but used in various parts of the world. Some of these belong to the genus *Dolichos*, and are nearly allied to the kidney bean,—as the *Dolichos hastatus* of the eastern parts of Africa, *D. lubia* of Egypt, *D. sphærospermus*, the calavana or black-eyed pea of

Jamaica, and the Lablab (*Dolichos lablab* or *Lablab vulgaris*), which is cultivated to a considerable extent in many tropical and subtropical countries, and is used in the same way as the kidney bean, both the green pods and the seeds being articles of food. Another species (*Dolichos Nankinicus* or *Lablab Nankinicus*) is cultivated in China. The seeds of *Psophocarpus tetragonolobus* are used as peas in the Mauritius, and those of *Voandzeia subterranea* in Surinam and in some parts of Africa.

CHAPTER XX.

MANIOC, MANDIOC, OR CASSAVA.

THE Manioc, Mandioc, or Manihot, also called the Cassava, is a native of the warm regions of America, and was cultivated by the inhabitants of Brazil and Mexico, affording them the chief part of their food, before these countries were known to Europeans. It is the *Manihot utilissima* of some recent botanists, *Janipha manihot* of others, and the *Jatropha manihot* of Linnæus. It is a shrubby plant, from four to eight feet high, with a slender, woody, knotted stem, and large alternate palmated leaves, the segments lanceolate, acuminate, and entire — the largest about six inches long. It belongs to the natural order *Euphorbiaceæ*, an order remarkable for the prevalence of acrid and poisonous juices, and is nearly allied to the physic nut (*Curcas purgens*) of Jamaica, noted for the fierce acridity of its seeds. Nor does the mandioc differ in this respect from its allies, and the juice even of its tubers is very acrid and poisonous. Yet, from the amylaceous stores of these tubers, after the poisonous juice has been removed, are prepared the nutritious and wholesome cassava bread, much used as an article of food in tropical America, and the tapioca, well known throughout the world, and one of the most esteemed varieties of starch.

The root of the mandioc is branched and woody. Its lateral branchlets swell into tubers, which are black externally, knotty, and somewhat tapering, of a great size, sometimes weighing thirty pounds. The rind being removed, the tubers are reduced to a pulp by rasping, or by holding them against a wheel or grindstone; the pulp is washed with water, pressed, and baked upon iron plates, and now becomes cassava bread; whilst the starch which floats off in the water is sometimes imported into Europe under the name of Brazilian arrowroot, but is more generally subjected to a process of granulation, by which it becomes tapioca. The poisonous substance of the tubers, which is supposed to be hydrocyanic acid, is completely removed either by washing or by heat. It is very volatile; and although cattle are poisoned by eating the fresh root, yet if it is cut in small pieces and exposed to the sun, they eat it without injury. It is said that the expressed juice of the mandioc root is one of the substances used by the Indians for poisoning their arrows.

A variety of the mandioc is cultivated under the name of sweet cassava, the common kind being called the bitter cassava. The sweet cassava, regarded by some botanists as a distinct species (*Janipha Loeflingii*), has a spindle-shaped root, brown externally, and only about six ounces in weight, but almost quite free from the acrid and poisonous qualities which belong to the juice of the common kind.

The mandioc is generally propagated by cuttings; and in about eight months after they are planted, the tubers may begin to be gathered. It is rather impatient of moisture, but requires a good soil.

The juice is sometimes fermented along with molasses, producing an intoxicating beverage, of which Indians and negroes are very fond.

The root of *Cnidoscolos herbaceus*, a plant of a nearly allied genus, is used in the same way as that of the mandioc in Mexico and Carolina.

CHAPTER XXI.

COCO OR EDDOES, PORTLAND SAGO, ETC.

THE natural order *Araceæ*, like the order *Euphorbiaceæ*, to which the mandioc belongs, is remarkable for prevalent acridity. Some of the species are dangerous from their poisonous qualities, and the dumb cane of the West Indies is so acrid, that a man putting it into his mouth is affected with excessive swelling and excruciating pain in his tongue. Yet to this order belong many plants, valuable as affording wholesome food, and some of them cultivated to a considerable extent in warm countries. The characteristic acridity of the order is found in all of them; but stores of amylaceous matter, capable of being easily separated from it, are found in the *corms*. A corm is a swelling of the root, resembling a bulb, and from it the .true roots spring. It differs from a bulb in not being composed of separable scales, but appears nearly to agree with it in the purpose which it serves, as a store of nourishment for the future stems and leaves of the plant, and, like the bulb and tuber, it is often a beneficent provision for the wants of man.

The most important of the *Araceæ* which supply human food are natives of warm countries; and indeed the order chiefly abounds in warm countries, only a few species being natives of temperate ones. It may be well, however, to begin by taking notice of a British plant belonging to this order, the starch obtained from which is known by the name of Portland sago. It is the cuckow-pint or wake-robin (*Arum maculatum*), common in woods and under hedges in most parts of England, although rare in Scotland and in Ireland. It has a few long-stalked leaves, all springing from the root, large, and somewhat arrow-shaped, often spotted with black. The flowers, which are small, are, as in this order generally, placed on a *spadix*, a slender club-shaped elongation of the flowering stem, surrounded by a convolute leafy *spathe* or sheath. The top of the spadix is of a beautiful purplish colour. The female flowers, which are at the base of the spadix, are followed by a few scarlet berries crowded into an

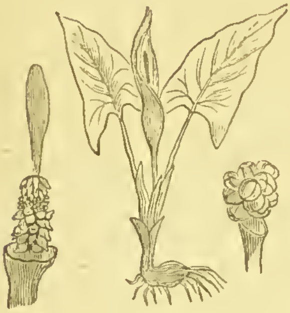

FIG. 11.—ARUM MACULATUM.

oblong spike, which remain during winter, when the leaves and spathe have decayed. The corm is roundish, and, when ripe, abounds in amylaceous matter or starch, although its juice is very acrid, as are also the leaves and other parts of the plant. The starch has been long in use as an article of food where the plant abounds. It receives the name of Portland sago, from Portland Island, in Dorsetshire. There, and at Weymouth, it is prepared and sold in large quantities. Due attention, however, does not seem to be paid to this plant in some other parts of England in which it is very plentiful. It appears to be generally taken for granted in this country, that the small size of the corms renders it unworthy of cultivation; yet it is much cultivated in India, where it is called *kuchoo* and *gaglee.* The acridity of the corms is owing, at least in part, to *saponine,* which is present in such quantity that they are used in Switzerland as a substitute for soap. The acridity is so great, that the raw corm applied to the skin will produce blistering. It is removed by roasting or boiling, and the corm is afterwards dried and pounded, or the starch is extracted by water.

Arum Indicum is a species of the same genus, much cultivated in Bengal for its esculent stems and small tubers. It is called *man-kuchoo* and *man-guri.*

In some parts of India, a plant nearly allied to these, and formerly ranked by botanists in the same genus, the *Amorphophyllus campanulatus*, is cultivated for the wholesome and nourishing starch obtained from its great flat corms. It is called Ol by the Bengalese. It is a plant of remarkable appearance, a short solitary stem bearing a spadix, which has a large fungoid top, and is surrounded by a spathe with a waved and spreading limb, the spadix and spathe being almost all that is seen above ground. Other species of the genus *Amorphophyllus* yield starch in the Indian Archipelago.

Colocasia antiquorum (*Arum colocasia* of Linnæus) is a native of the Levant, and other warm and tropical regions of the old world, and is now cultivated in all quarters of the globe where the heat is sufficient. It is commonly known as *coco, cocoa-root*, or *eddoes*, which names, however, are also given to some of its congeners, and other nearly allied plants. It is a stemless plant, with peltate ovate leaves, and a cylindrical erect convolute spathe much longer than the spadix. The corms are acrid, but are deprived of their acridity by boiling, and are much used as an article of food. The leaves are also deprived of their acridity by boiling and changing the water, and are used as spinach. *Colocasia esculenta*, also known as *Caladium esculentum*, is a very similar plant, with heart-shaped leaves, a native of tropical America. It is cultivated and used in the same way as are also several other species of *Colocasia* and *Caladium*. *Colocasia Himalensis* affords a principal part of their food to the inhabitants of some parts of the Himalaya. *Colocasia macrorhiza* is the *tara* or *kopeh* of the South Sea Islands, which is very extensively cultivated there, and is of great importance to the natives.

It may not be out of place here to notice the amylaceous fleshy root-stocks of the Cat's Tail or Reed Mace (*Typha latifolia* and *T. angustifolia*), which are eaten by the Cossacks and Kalmucks. These plants belong to a small natural order, *Typhaceæ*, very generally regarded as a sub-order of *Araceæ*, and are natives of Britain and most parts of Europe, growing in ditches and ponds. They are sometimes called bulrushes, although the true bulrush is a very different plant. *Typha latifolia* is the larger of the two. It has stems from three to six feet high, with very long leaves, sometimes more than an inch broad, and very small flowers arranged in immense numbers on an erect spadix, which has no spathe, the appearance of which has given origin to both the English names.

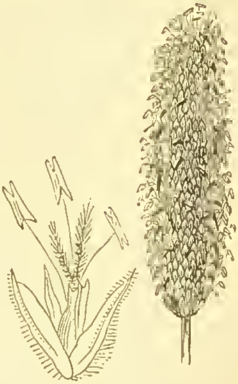
FIG. 12.
CAT'S TAIL GRASS.

The young shoots are much used by the Cossacks of the Don, and are sometimes eaten in other countries under the name of Cossack asparagus. The plant is probably worthy of more attention than it has generally received.

Another plant allied to the *Araceæ*, and by some botanists ranked in that order, although by others placed in a separate order, *Orontiaceæ*, is the *Calla palustris*, a native of marshes in the coldest regions of the northern hemisphere, in Europe, Asia, and America. It has a creeping root-stock, heart-shaped stalked leaves, and flowers arranged on a spadix which is enclosed in a spathe. The spathe is flat and white, and the stamens and pistils are mixed on the spadix. The root-stocks are extremely acrid and caustic, yet they are made into a kind of bread, which is held in high estimation by the Laplanders, the acridity disappearing in the process of preparation, which is by drying, grinding, and macerating.

CHAPTER XXII.

SALEP, AND ORCHIDEOUS PLANTS.

THE beauty of tropical orchids is not only well known by the descriptions of travellers, but by fine specimens to be seen in our hothouses, whilst some of our native species, on account of their elegant and curious forms, attract the regard of all lovers of nature. Some species have tuberous roots, from which is obtained a nutritious substance called salep, an agreeable article of food, possessing emollient and demulcent properties. It does not consist wholly or chiefly of starch, but of a chemical principle called *Bassorin*, resembling starch, but also somewhat resembling gum.

Salep is used to a considerable extent as an article of food in Turkey, Syria, Persia, and other parts of the East, and it is imported into the western parts of Europe from the Levant. It occurs in commerce in pieces generally of an oval form, very hard, and of a yellowish-white colour. These oval pieces are the tubers deprived of their skin, and dried in an oven. To prepare them for use, they only require to be boiled in water or milk, in which they dissolve, forming a dish like arrowroot. Salep is regarded as very nutritious.

It is still uncertain what species of orchids chiefly yields the salep of commerce. The probability appears to be that it is obtained from more species than one. It is certain that the roots of a number of species are occasionally employed. There is reason to believe that a considerable part is the produce of *Orchis mascula,* a well-known native of Britain, commonly called the Early Purple Orchis. This species is chiefly found in moist pastures, and its beautiful loose spikes of purple flowers are produced in June. The leaves are oblong, and, as in some other species of the genus, often marked with dark purple spots. The root has two fleshy tubers, both undivided, and of an oval form. Salep made from this plant in England, however, is not equal in quality to that brought from the East.

Salep is sometimes made in England from the roots of *Orchis maculata,* a species very common in pastures and heaths, and which has two palmated tubers; also from *Orchis morio* and *O. militaris,* — the latter of which grows on chalky hills, the former in meadows and pastures. Both these species resemble *O. mascula* in their undivided tubers. *O. papilionacea*, a native of the south of Europe, is another of the species from which salep is sometimes obtained; and in India the same use is made of the tubers of *Eulophia vera* and *E. compestris*—plants belonging to a different section of the same natural order.

CHAPTER XXIII.

ARROWROOT, TOUS-LES-MOIS, ETC.

WE must now go on to notice other plants yielding kinds of starchy farina which are used for food. Some of the finest kinds are known by the name of Arrowroot, which is probably derived from an Indian word, *Ara.*

It has already been mentioned that the starch obtained from the mandioc bears the name of Brazilian Arrowroot; but the true West Indian Arrowroot, of which the finest kind is brought from the Bermudas, is the produce of *Maranta arundinacea,* a plant of the natural order *Marantaceæ.* This is an order of endogenous or monocotyledonous plants, closely allied to the *Seitamineæ* or *Zingiberaceæ,* the order which yields ginger and other similar products, and from some species of which a starchy farina similar to arrowroot is also obtained. Both these orders are composed entirely of herbaceous perennial plants, natives of tropical countries. They generally have creeping root-stocks, simple sheathing leaves, and showy flowers. The *Maranta arundinacea* is a native of tropical America. It has branched stems rising to the height of two or three feet, with ovato-lanceolate leaves, which are rather large, and not very numerous. The flower-stalks are two-flowered, and the flowers white. The root-stock is creeping, and attached to it are tubers of an elongated form, curiously covered with scales. The tubers are gathered when the plants are about a year old, and the starch is extracted by grating or beating them to a pulp and washing with water,

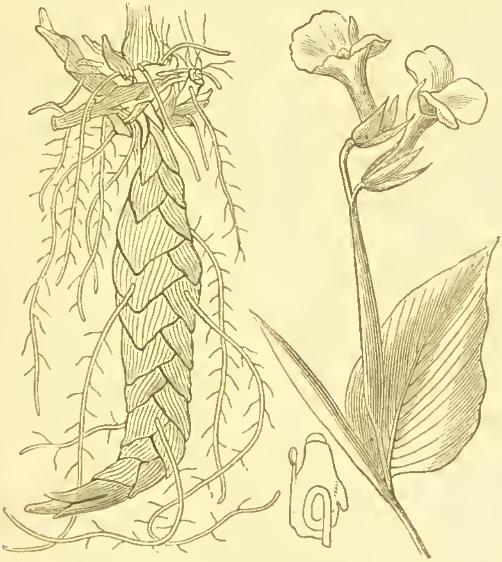

FIG. 13.—MARANTA ARUNDINACEA.

in the same way that starch is obtained from potatoes. The plant is cultivated to a considerable extent in the West Indies, and the starch is a somewhat important article of commerce.

Some portion of the West Indian arrowroot is also obtained from *Maranta allonyia* and *M. nobilis*, both natives of the tropical parts of America. The tubers of *M. allonyia*, cooked with pepper and salt, are eaten in the West Indies. The plants of this order are quite free of the acrid, poisonous principle so largely prevalent in the orders which yield cassava and the coco-root. They are equally free of the aromatic heating principle which forms so notable a characteristic of the root-stocks of ginger, galangale, and other plants of the order *Scitamineæ*, already mentioned as very nearly allied. India has also its native species of *Maranta*, and arrowroot is there prepared in considerable quantity from *M. Indica* and *M. ramosissima.*

A kind of starch very similar to arrowroot, yet sensibly different, is obtained in the West Indies from the tubers of some species of the genus *Canna*, a genus very nearly allied to *Maranta*, and is known by the name of *Tous-les-Mois.* The *tous-les-mois* of our shops is probably the produce of a number of species of *Canna.* *C. edulis*, a native of Peru, is regarded as a principal source of it; and it is said to be obtained also from *C. achiras,* a native of great part of tropical America, and from *C. coccinea,* a native of the East Indies. The tubers of *C. achiras*—the *Achira*—are eaten in Chili and Peru. Most of the species of *Canna* have showy, red, yellow, or orange flowers. The round black seeds are known by the name of *Indian shot.*

Along with the peculiar aromatic heating principle already mentioned—a pungent volatile oil—the root-stocks of many of the *Scitamineæ* contain much starch. The pungent oil, however, in many of them cannot be separated from the starch so that it may be used. From other species, starch of good quality is readily obtained. Even from the root-stocks of the galangale (*Alpinia galanga*) starch is extracted in considerable quantity in the Indian Archipelago, of which it is a native. It is a plant with perennial stems, six or seven feet high, broad leaves, and a terminal branched panicle of greenish-white flowers. Part of the East Indian arrowroot of commerce is also obtained from the tubers of several species of the genus *Curcuma,* from the young tubers of the Turmeric plant (*C. longa*), and from those of *C. angustifolia, C. rubescens, C. leucorhiza,* and the Zedoary (*C. zerumbet*). In some parts of India this kind of arrowroot is a principal article of food. The tubers are white when young, and consist chiefly of a beautiful, pure, amylaceous matter; when they become old, they acquire the colour and flavour which distinguish turmeric and zedoary.

The list of plants affording starch similar to arrowroot is far from being exhausted. The potato has been already mentioned. We have now to turn to an order very different from any yet noticed,—the natural order *Cycadaceæ*, which contains a number of species valuable for the starch which they yield; that of some being regarded as a kind of sago, and that of others as a kind of arrowroot, although the difference probably arises more from the mode of preparation than from any peculiar original qualities of the plant. The *Cycadaceæ* are small trees or shrubs having very much the general aspect of palms, although in some of their botanical characters they are more nearly allied to pines and firs (*Coniferæ*) than to any other natural order. They have large pinnate leaves, which unfold themselves in the same manner as the fronds of ferns. They are natives of warm climates, although by no means confined to the torrid zone; and the fossils of some of our rocks show that at some former period they must have constituted an important part of the flora of Great Britain. To this order belongs *Dion* *edule*, a native of the lowlands of Mexico, from the large seeds of which a kind of arrowroot is produced. To this order also belongs the genus *Zamia*, certain dwarf species of which, natives of the West Indies, supply a kind of starch of good quality, sometimes sold as arrowroot. The store of this starch is in the dwarfy fleshy trunk of the plant, a source similar to that from which sago is procured. The stems of the *Cycadaceæ* consist in great part of a mass of pith traversed by bundles of woody fibres.

CHAPTER XXIV.

SAGO.

SAGO is a kind of starch derived from the trunks of some species of palms, and from some of the *Cycadaceæ.* It is obtained by bruising and washing in the same manner as other kinds of starch, but it almost always appears in commerce in a granulated state, the ungranulated starch being very apt to become sour if exposed to the air. The granulation is accomplished by moistening it, and passing it through a sieve into an iron pot placed over a fire.

Most of the sago imported into Europe is brought from the Indian Archipelago, and is the produce of *Sagus laevis* or *inermis*, which is therefore sometimes called the True Sago Palm. This palm forms immense forests in some of the islands. A single tree yields from 600 to 800 pounds of sago. To procure the sago, the tree is felled, cut into lengths, and the soft central part of the trunk beaten into a pulp with water. The fibres are thus separated, and float on the surface, whilst the starch settles to the bottom.

Another species of the same genus, *Sagus Rumphii*, a native of the same regions, also yields large quantities of sago, which, however, it is said, is mostly used in the East Indies, and seldom exported to Europe. It grows to the height of about thirty feet, and attains a thickness of five or six feet. Its stem is much covered by the sheathing bases of old leaves, and the crown is larger in proportion to the size of the tree than in most of the palms. It differs from *Sagus laevis* in having the leaf-stalks and spathes guarded by

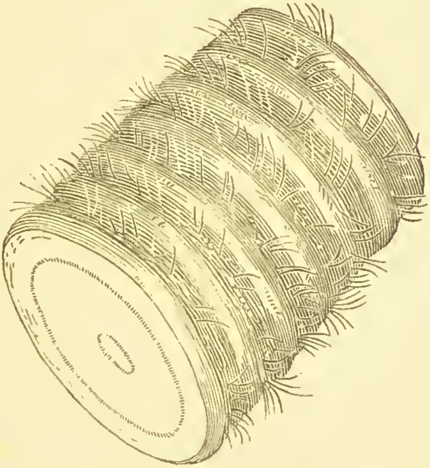

FIG. 14.—SAGUS RUMPHII.

strong prickles, whilst those of *S. laevis* are unarmed.

Sago is also obtained in large quantity, and of excellent quality, from the Gomuto Palm (*Saguerus saccharifer*, or *S. Rumphii*, or *Arenga saccarifera*). This is a tree of twenty to twenty-five feet high, very abundant in the islands of the Indian Archipelago. It is one of the most valuable of the palms, yielding in great quantity one of those beverages so much used in the East, and known as palm wine, and yielding also a large quantity of sugar. When the tree is exhausted by the loss of its saccharine sap, incessantly drained off, it is cut down, and sago is obtained from the soft cellular part of the trunk, although the timber is extremely hard, and is used for building. The fruit of this palm—a yellowish globose drupe, with two or three stones—is extremely acrid, and excites

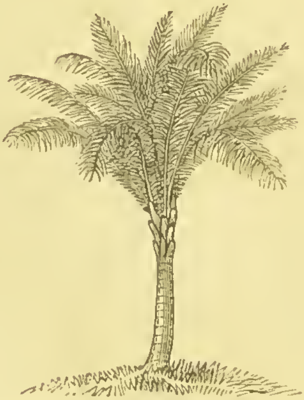

FIG. 15.—GOMUTO PALM.

severe inflammation in the mouths of those who eat it; yet the unripe albumen, soaked in lime water and boiled in sugar, forms a pleasant sweetmeat, which the highest classes in India and China use with their tea.

Caryota urens and *Phœnix farinifera*, natives of the East Indies, are also amongst the palms from which sago is obtained. The latter is a species of the same genus with the common date palm, the most valuable for its fruit of all the palms. The fruit of *Caryota urens* has the acridity already noticed as characterizing that of *Saguerus saccharifer*, and, like that palm, it yields sugar and palm wine. Old trees of *Caryota urens* are cut down for the sake of their farinaceous pith, after having for many years been an abundant source of *toddy* or palm wine. The farinaceous pith is made into bread, and the sago made from it is said to be quite as good as that of the True Sago Palm.

A kind of sago is obtained from the trunk of the Gebang Palm (*Corypha Gebanga*), one of the most useful of the palms of India, chiefly, however, on account of the fibres of its leaf-stalks and young leaves, which are employed in various manufactures.

Cycas circinalis and *C. revoluta*, of the natural order *Cycadaceæ*, also yield sago, which is obtained from the cellular tissue in the interior of the stem. From the stems, a clear, insipid, mucilaginous juice exudes, which hardens into a transparent gum, resembling tragacanth. *C. circinalis* is a native of the Indian Archipelago. The sago which it yields is said to be of inferior quality. The fruit is eaten in the Moluccas. The kernels are in some degree farinaceous, and a kind of flour—of bad quality—is made from them. *C. revoluta* is a native of Japan, and is there held in very high esteem on account of the sago which it yields. The nuts are also eatable.

CHAPTER XXV.

THE PLANTAIN AND BANANA.

THE Banana is one of the most valuable gifts of the bountiful Creator to the inhabitants of the warmer regions of the globe. It grows wherever the mean temperature exceeds 65° Fahr. The Plantain and Banana are now generally regarded as mere varieties of the same species, although they were formerly described as distinct,—the banana as *Musa sapientium*, and the plantain as *Musa paradisaica.* The fruit, in a ripe state, is sweet, soft, and amylaceous. That of some of the varieties is chiefly used as an article of luxury, like other dessert fruits ; but that of other varieties, in which the starchy matter is present in greater quantity, is in many countries a principal article of food, being used in various ways, and chiefly as a substitute for bread.

This plant is a native of tropical Asia, but is now cultivated in all warm countries. Its cultivation is extremely easy, and its produce more abundant than that of any other food plant. Humboldt calculates that the same extent of ground which yields to the industrious and skilful cultivator 33 pounds of wheat, or 99 pounds of potatoes, will yield, with far less labour, 4000 pounds of ripe plantains, being to potatoes nearly 44 to 1, and to wheat nearly 133 to 1; so that the same extent of ground which produces wheat to maintain two persons, will produce bananas or plantains to afford sustenance for fifty.

The cultivated varieties of this plant are very numerous, and even the names Banana and Plantain seem interchangeable, and are variously applied in different parts of the world. The varieties differ not only in the qualities of the fruit already referred to, but also to some extent in form and colour, and very much in size.

The natural order to which the genus *Musa* belongs—*Musaceæ*, an order of endogenous plants—contains only a small number of species, all natives of tropical and subtropical countries. They have no true stem, but they have subterranean root-stocks, from which shoots ascend; and the sheathing bases of their great leaves form false stems, often very large and tree-like, the leaves at the summit in a spreading crown, as in palms. The plantain attains a height of twenty feet or upwards, although the stalk is seldom more than seven or eight inches in diameter. The leaves are very beautiful, ovato-lanceolate, about six feet in length, and two or more in breadth, smooth, and of a vivid green ; but soon after they attain their full size, the edges are generally torn by the wind. The veins are parallel, and proceed in a curved manner from the midrib to the margin. The flowers, which are purple, burst through spathes, and form a large bunch, which is succeeded by the clustered fruit, to the amount of 150 or 180 plantains, weighing 60 or 80 pounds, and causing the top of the stem to bend over, so that they may be reached by the hand. Each stem—for the term must be used, although not scientifically accurate—produces only one of these great bunches of fruit. After the fruit is gathered, the stem is cut down, and new ones spring from the same root, so that the plantation does not require to be renewed for many years.

The young shoots of the banana are boiled and eaten, and are a very pleasant article of food. The great leaves are used for thatching cottages, and for various other purposes.

Another species of *Musa*, *M. Cavendishii*, produces an eatable fruit resembling the banana, and has been found to ripen its fruit more readily in hot-houses in Britain than the common species. Most of the other species of *Musa* have austere and uneatable fruits. The leaves of some yield a valuable fibre, to be afterwards noticed.

CHAPTER XXVI.

THE BREAD-FRUIT.

THE Banana is not the only fruit that affords a ready substitute for bread. The name of the bread-fruit will readily occur to every one ; and although the accounts given of it by the first visitors to the South Sea Islands certainly exaggerated its value, it deserves a prominent place in any account of plants used for human food.

The Bread-fruit Tree (*Artocarpus incisa*) belongs to a natural order entirely tropical, *Artocarpaceæ*, which, however, according to many botanists, is a sub-order of *Urticaceæ*, a great natural order of which the nettle is the type, and in which, grouped in sub-orders, are hemp and the hop, the mulberry and the fig,—plants botanically allied, notwithstanding the great diversity of characters which present themselves at first sight to the unscientific observer. The bread-fruit is a native of the islands of the

Pacific Ocean and of the Indian Archipelago. It grows to the height of fifty or sixty feet, and has spreading branches, and large, rough, pinnatifid leaves, often a foot and a half long. The male flowers are in catkins, the female flowers naked and arranged on a fleshy receptacle ; the whole becoming a sub-globose, fleshy, tuberculated fruit about as large as a child's head. It is yellowish when ripe, and under a skin of no great thickness is found an amylaceous substance perfectly white, and somewhat resembling newly baked bread. It is used either as bread, or for making a kind of pudding, and it is sometimes sliced and dried before the application of heat, sometimes cooked in an oven. The Tahitians have long been accustomed to prepare it for use by beating it into a paste with water or the milk of the cocoa-nut, or by subjecting it in heaps to fermentation, by which it first becomes disagreeably sweet, but afterwards sour, and in this state is made into balls, wrapped up in leaves, and baked in a kind of oven. It is eaten either cold or hot.

It is well known what efforts were made by the British Government, at the urgent instance of many West Indian merchants and proprietors, to introduce this tree into the West Indies ; for which purpose the ship Bounty was sent out under the command of Lieutenant Bligh, in 1787. The story of the mutiny, of Bligh's long voyage in an open boat, of the occupation of Pitcairn's Island by the mutineers, and of the growth of the remarkable colony which they founded, have invested this subject with an unusual interest. In 1793, Bligh, having been sent out for the same purpose as before, landed at Port Royal, in Jamaica, 347 bread-fruit plants, and many other plants, among which were some of the finest fruits of the East. It might have been well for some of the British colonies if enterprise had more frequently been directed to such objects. The bread-fruit, however, in the West Indies, has not answered the expectations which were formed of it. The negroes preferred the plantain as an article of food, and the plantain is also more productive, and more easy of cultivation.

Before the bread-fruit is ripe, it is filled with a substance, not of the consistency of new bread as above described, but a thick tenacious white milk. The leaves, if wounded, give out a milky juice, which, indeed, exists in almost all parts of the plant. This fact is interesting, because of the botanical affinity subsisting between this tree and some of the trees from the milky juice of which caoutchouc is obtained (as *Castilloa elastica* and *Cecropia peltata*), and also from its affinity to the Cow Tree or Palo de Vaca of South America (*Galactodendron utile* or *Brosimum Galactodendron*), the milk of which is used as a substitute for that of the cow, and is highly nutritious and pleasant. To this order, however, also belongs the *Antiaris toxicaria*, one of the upas trees of Java, from the milky juice of which is derived the poison called Antjar or *Upas-Antiar*, or Bohun-Upas by the Javanese, a poison of a most deadly and virulent character.

The bread-fruit tree is not only useful for the supply of food from its fruit; cloth is made from the inner bark, and the timber is employed for building houses and making boats. The male catkins also are used for tinder, and the viscid milky juice as bird-lime.

Another species of the same genus with the bread-fruit is the Jack (*Artocarpus integrifolia*), a native of the south of India, and called in the Teloogoo language, *Jaca*. It attains a height of 80 or 100 feet, and has spreading branches and dark-green unlobed leaves. The fruit is somewhat similar to the bread-fruit, but much larger, weighing from thirty to fifty pounds, and growing in a remarkable manner, like the figs of the sycamore, not from the small branches, but in young trees from thick branches, in older trees from the trunk, and in aged ones immediately above the ground. The fruit is covered with a very rough and green skin, and is full of white stones about the size of a pullet's egg. It is very inferior to the bread-fruit.

To the natural order *Artocarpaceæ* belongs also the *Brosimum alicastrum*, a West Indian tree, of which the nuts, boiled or roasted, are eaten instead of bread. They have a taste somewhat resembling that of hazel nuts, and are very nutritious.

CHAPTER XXVII.

THE DATE PALM.

DATES, the fruit of the Date Palm (*Phœnix dactylifera*) furnish the chief part of their food to the inhabitants of extensive regions, both in Asia and Africa. This is either exclusively the palm tree of the Bible, or that which is chiefly meant, as it was the kind of palm best known to the Jews. It was in ancient times, as it still is, very extensively cultivated in Egypt, and appears to have been common also in Palestine,

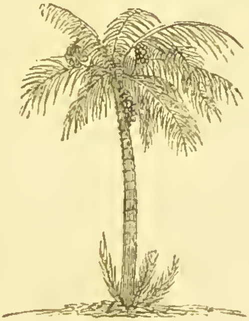

FIG. 16.—DATE PALM.

although it is not so now; and, indeed, in the northern parts of that country, the trees which exist are of little use except for ornament and shade, as they seldom ripen their fruit. The date palm, however, reaches farther to the north, and subsists in colder regions, than almost any other palm. It is to be seen in some of the warmest parts of the south of Europe, although it is not a native of Europe, but probably of Arabia and of the north of Africa, of the sandy regions bordering on the deserts, and of the oases of the Great Desert. It is the tree whose shade the weary traveller enjoys when he comes to a well in the midst of the sandy waste, like the Israelites when 'they came to Elim, where were twelve wells of water, and threescore and ten palm trees' (Ex. xv. 27).

The date palm is not one of the most stately and magnificent of the palms, yet is a beautiful tree, and supplies some of the most exquisite imagery of Scripture.

The stem rises to the height of fifty or sixty feet, cylindrical and unbranched, but with such vestiges of former leaves as serve to support the feet in climbing the tree for the purpose of gathering the fruit. The stem is a foot or eighteen inches thick. The crown of leaves is very large and beautiful. The leaves are from six to eight feet long, firm, but gracefully bending; the leaflets glaucous, shining, lanceolate, acuminate, numerous, the lower ones often three feet long, but not more than an inch in breadth, stiff and firm in texture. Before their expansion they are matted up with loose fibres, and at the base of the leaf-stalk there is a quantity of fibrous matter. These leaves are often called branches; but the palm tree has in reality no branches. The fruit is produced in great bunches, which grow from the summit of the stem, each bunch or cluster often weighing from fifteen to twenty pounds, and a tree producing from fifteen to twenty such clusters. The tree, however, is diœcious, that is to say, the male and female flowers are produced on different trees; and experience has not only taught the cultivators the necessity of having a few male trees to fertilize the female ones, but the fecundation of the female flowers by the pollen of the male has been long practised by the Arabs, a crop of dates being thus more perfectly secured, and a smaller number of male trees, which, of course, are themselves fruitless, being sufficient for a grove.

The date is an oblong fruit, about the size of an ordinary plum, although there are many varieties, differing in size and other particulars. It is, like the plum, a drupe; but within the fleshy part there is not a nut with a kernel, but a single large cartilaginous seed of a dark brown colour, with a groove along one side of it. The date is common in our shops as an article of luxury; but with us it is nothing else. In the countries in which it is chiefly produced, it is a principal article of food, and wealth is reckoned by the number of palms which a man possesses; whilst an Arab proverb represents the vain pretender to consequence as falsely boasting that the dates which he eats are the produce of his own palm trees.

The most common variety of the date, when perfectly ripe, is soft and pulpy, and very sweet. But dates intended to be dried, are not allowed to attain perfect ripeness.

The date palm reaches its maturity in about thirty years, but begins to bear fruit when much younger. It continues in full productiveness for at least other seventy years, and trees have been known to attain an age of some centuries.

The hard and solid seed of the date, when softened by steeping for some days in water, or ground into a coarse powder, is used as food for camels and other domestic animals, and is very acceptable to them, and very nutritious.

A species of *Phœnix* (*P. sylvestris*) nearly allied to the date palm, is common in India. It yields great quantities of saccharine juice, from which sugar (*jaggery*) is made. Its fruit is very inferior to the date of Egypt or Arabia; but the inferiority is perhaps owing to the continual drain of the saccharine juice, by which the tree must be much weakened.

Not many of the palms produce eatable fruits, and those which do have mostly fruits very different from the date; as, for example, the cocoa-nut. The Doom Palm (*Hyphæne Thebaica*), a native of Egypt, produces a fruit, the thick, brown, mealy rind of which has a remarkable resemblance to gingerbread. The doom palm is one of the few branching palms, although it does not throw out branches after the manner of other trees; but the stem is several times forked, and each branch has its own crown of leaves.

CHAPTER XXVIII.

THE COCOA-NUT.

THE Cocoa-Nut tree (*Cocos nucifera*) is another species of palm, demanding special notice as one of the precious gifts bestowed on the inhabitants of tropical regions. It is one of those plants which of themselves suffice to supply many of the wants of life.

The stem is very tall, often more than eighty feet in height, not always quite erect, but often somewhat bent in various directions, unequally ringed with marks of the bases of former leaves, and bearing at the top a crown of eight or nine great spreading pinnate leaves, with spreading linear-lanceolate leaflets. The flowers grow in branching spadices, —the male flowers towards the extremities, the female flowers at the base of the branches. The fruit is a drupe, coarsely three-cornered, and often about as large as a man's head; the outer part a thick fibrous husk, within which is a hard shell. When the nut is young and unripe, the whole hollow of the shell is filled with an agreeable, sweetish, refreshing liquid—the 'milk,'—which is much used as a beverage. As the nut ripens, a formation of albumen takes place on the inside of the shell, producing that white, firm substance, pleasant to the taste, but somewhat indigestible, which is familiar to every one as the kernel of the cocoa-nut. The kernel contains a large quantity of bland oil, which is obtained from it by expression after boiling, and is much used both as an article of food and for lamps. The finest oil is obtained by merely grating the kernel, and exposing it in a wooden trough to the heat of the sun, when the oil runs off. Cocoa-nut oil, however, very speedily becomes rancid, and therefore is not an article of much commercial importance; whilst the cocoa-nut kernel, as we purchase it in our shops, is, for the same reason, generally very inferior in quality to that of the nut newly gathered from the tree. Nor is the small quantity of milk which remains in the hollow centre of the kernel, when ripe, so agreeable as that which the inhabitants of tropical countries obtain from the unripe nut. Its sweetness remains, but its acidulous quality is gone. The kernel of the cocoa-nut is prepared in a variety of ways as an article of food. In Ceylon, it is employed in making curries; or the nut is rasped and washed in water, by which a kind of milky fluid is formed, which is used in cookery.

Mention has already been made of the great variety of uses to which different parts and products of the cocoa-nut tree are applied;[1] and it will be necessary again to take more particular notice of some of these in subsequent chapters.

The cocoa-nut is a native of the sea-coasts of tropical countries. It does not in general succeed well except near the sea, and is often to be seen growing within the tide-mark on level shores. It is in general the first arboraceous plant which appears on the coral islands of the Pacific Ocean, its nuts being wafted by the winds and waves from one coast to another. The husk and the shell serve to protect the embryo from injury by the salt water, and the trade-winds and currents carry the nuts to great distances. Drifted about as the seed is in all tropical seas, it is impossible to say to what quarter of the globe the cocoa-nut originally belongs. It seems equally indigenous in all.

Every one must have remarked that there are three *eyes* at one end of the cocoa-nut shell, one of which is easily pierced, whilst the others are covered with hard shell. These three eyes indicate the original structure of the nut, which is formed from a three-celled germen or ovule. It is from the eye that is easily pierced that the young shoot springs when the nut germinates, whilst the firmer coverings of the other two eyes are afterwards pushed off by the roots which issue from the shell by these holes to descend into the ground. It is about five or six months after the nut is planted before the young tree begins to appear above ground; in about five or six years the stem is seven or eight feet high, and then it begins to bear fruit. It continues to grow and to bear fruit for at least fifty or sixty years. A large tree sometimes produces about 100 nuts in a year; and in the South Sea Islands a very small grove of cocoa-nut trees is regarded as affording sufficient provision for a family. To gather the fruit, the tree is climbed; and a Tahitian boy climbs one of these tall trees more quickly than a European would ascend a ladder. He strips off a piece of bark from a branch, and fastens it round his feet, leaving a space of four or five inches between them, having the stem of the tree between his legs, then clasps the stem in his arms, and begins to vault up it. When a bunch of fruit is gathered at once, it is lowered by a rope; when single nuts are gathered, they are flung to the ground, and a twirling motion is given to them, that they may fall on the end, and not on the side, in which case they would be likely to burst.

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[1] See pp. 8–10.

There are other species of the genus *Cocos*, all American, but they are of little value. The nuts of *C. Cutyracea* contain a very large quantity of a thick oil which is used in some parts of South America as a substitute for butter.

A remarkable fruit, but of no economic importance, called the Double Cocoa-Nut, is produced by a palm (*Lodoicea Seychellarum*), which is found only in the Seychelles Islands.

CHAPTER XXIX.

THE CHESTNUT.

BOTANICALLY, the Chestnut (*Castanea vesca*) differs very much from the cocoa-nut, belonging to the natural order *Corylaceæ* or *Cupuliferæ*—the same which contains the hazel and the oak—and to the endogenous division of the vegetable kingdom. But, like the cocoa-nut, it is of importance as affording a principal article of food in some parts of the world.

The Chestnut—sometimes called the Sweet Chestnut, in contradistinction to the Horse Chestnut, the fruit of which is bitter and uneatable, and sometimes the Spanish Chestnut, because the best fruit of this kind is brought to the English market from Spain—is of a genus so nearly allied to the beech (*Fagus*), that by Linnæus it was united with it. The genus *Castanea* differs from *Fagus* in the character of the germen, and in the form of the nuts, which are roundish, whilst those of the beech are triangular. The nut of the chestnut is very farinaceous, and contains little oil.

The chestnut is a very beautiful tree, of great size. The trunk is often very thick; the crown is spreading. The leaves are of an oblong-lanceolate shape, strongly veined and serrated, of dark glossy green, changing to yellow at an early period in autumn. The nuts are enclosed in a husk covered with weak spines. The timber is very valuable; and the bark is used for tanning, although inferior to oak bark. It is said that the finest ancient buildings in London are in great part formed of chestnut timber. The roof of Westminster Hall affords an example.

The chestnut derives its botanical and Latin name from Castanea, a city of Pontus, in Asia. Of the west of Asia it is certainly a native; but there is some doubt as to its being a native of the south of Europe, although it has long been cultivated there, and is at least naturalized. In Britain it is chiefly planted as an ornamental tree, and ripens its fruit only in the southern parts, or in very favourable seasons; but in some parts of the south-west of England it is completely naturalized. It succeeds well as a forest tree even in the northern parts of Scotland. A noble chestnut tree is to be seen at Castle Leod in Rossshire, sixty feet in height, and measuring twenty feet in circumference at three feet from the ground. A chestnut tree at Totworth, in Gloucestershire, is supposed to be the oldest in England. It was celebrated for its magnitude in the reign of King Stephen (A.D. 1135); and at five feet from the ground measures fifty-two feet in circumference. A chestnut on Mount Etna has long been famous. Its trunk, in 1770, measured 204 feet in circumference; but it was even then in a state of decay.

In the south of Europe the chestnut is very extensively cultivated for the sake of its fruit. There are numerous varieties of superior quality, which are preserved by grafting. The fruit is sometimes eaten raw, but more generally roasted or boiled. Many families in the south of France subsist chiefly on the produce of their chestnut trees. Chestnuts boiled in milk are, in some parts of France, a favourite breakfast dish.

The Chinquapine (*Castanea pumila*) is another species of the same genus, a native of North America, from Maryland to the Gulf of Mexico, but the fruit is much smaller than the chestnut.

The fruit of the Beech (*Fagus sylvatica*) is occasionally employed as an article of food. It is more valuable on account of its oil. Its use for fattening swine is well known. In some parts of Europe swine are fed in great numbers on the *mast*, or beech-nuts, of the beech forests; and in former days, when large tracts of England were covered with forests, use was made of them in the same manner. Sir Walter Scott makes mention of this in the first chapter of *Ivanhoe;* and no reader can forget Gurth the swineherd.

The Horse Chestnut (*Æsculus hippocastanum*) is not a variety of the chestnut, nor a tree of the same genus, or even of the same natural order, but belongs to the natural order *Sapindaceæ.* The flowers and foliage are very different from those of the chestnut; and the fruit, notwithstanding a great external resemblance, is very different in its qualities, and is very acrid and bitter. It is not certainly known of what country it is a native; but it came into Europe through Constantinople, and is supposed to belong to some part of Asia, although the other species most nearly resembling it are all natives of North America. It is one of the finest ornaments of our woods and lawns.

CHAPTER XXX.

CABBAGE, KALE, ETC.

WE must now proceed to notice those articles of vegetable food which are not farinaceous, and of which the most important are the leaves and succulent roots of plants used with little preparation except boiling or other cooking. The first place among plants, of which the leaves are thus used, must be assigned to the Kale or Cabbage (*Brassica oleracea*). It is a native of the sea-shores of Europe, and is found on some parts of the British coast. In its wild state it is a coarse plant, with loose, waved, spreading glaucous (sea-green) leaves, and very unsuitable for culinary purposes. It has been long in general cultivation, and the cultivated varieties are very numerous, and extremely different, so that they might readily be supposed to belong to distinct species, although there is nothing more certain than their common origin; and they manifest a continual tendency, when their cultivation is neglected, to revert to the original type. No plant cultivated in our gardens shows so great a disposition to vary, or, in gardeners' phrase, to *sport*. It belongs to the great natural order *Cruciferæ*, and to the same genus with the turnip and rape, to both of which it is very nearly allied. It has been in cultivation from the earliest historic times; but the history of the most valuable cultivated varieties cannot be traced far back, and it is not probable that those most esteemed by the ancients have come down to us unchanged. The leaves are the part of the plant employed for culinary purposes in all the varieties,

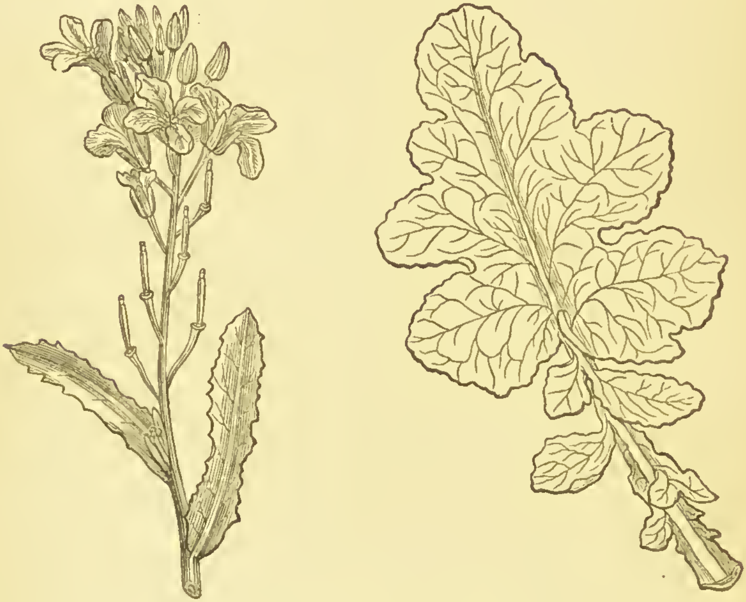

FIG. 17.—WILD CABBAGE.

except cauliflower, broccoli, and kohl rabi. The plant is a perennial, but does not subsist for many years; and some of the varieties are cultivated for use in the same year in which they are sown, others for use in the next year. Some kinds are frequently cultivated as a field crop for feeding cattle, but not so much in Britain as in some other countries. More generally in this country, even the coarser kinds are cultivated as garden crops, and chiefly for human food, although part of the produce is often given to milch cows. The leaves of the kale or cabbage are very nutritious, being extremely rich in gluten. Johnston, in his *Chemistry of Common Life*, has some interesting remarks on some of the popular dishes of which these leaves are a chief constituent. Combinations have been made, not from science, but as the result of experience, which science finds reason highly to approve, as bringing together in proper proportion the constituents requisite for thoroughly wholesome and nutritious food. Gluten, in excessive proportion, is injurious; but when combined with animal fat, oil, or starch, it forms a kind of food at once wholesome and highly nutritious. 'Bacon and greens,' Johnston says, 'like pork and pease-pudding, is a conjunction of viands which does not owe its popularity either to old habit or to the mere taste of the epicure. It is in reality an admixture which constitutional experience has prescribed as better fitted to the after comfort of the alimentary canal of every healthy individual, than either kind of food eaten alone. And so with a dish common in Ireland under the name of *Kol-cannon.* The potato, as we have seen, is poor in gluten. The cabbage is unusually rich in this ingredient. Mix the two, and you approach the composition of wheaten bread. Beat the potatoes and boiled cabbage together, put in a little pork fat, salt, and pepper, and you have a kol-cannon, which has all the good qualities of the best Scotch oatmeal, and to many would be more savoury and palatable.'[1]

It would be to depart from our purpose, and extend this chapter too much, to give an account of the methods of cultivation adopted for the different varieties of this species. Suffice it to say, that the seed is generally sown early in spring—that of some of the finer kinds, as cauliflower, often on a hot-bed—and the young plants are planted out when they have attained a proper size, in rows, and at distances corresponding to their expected growth. Some of the coarser kinds of kale will succeed tolerably even on poor soils, and the humblest cottage has, therefore, its 'kail-yard;' but the finer kinds require a rich soil, and it is almost impossible for the soil to be too rich or too abundantly manured. A frequent stirring of the soil is also advantageous; and the rows ought to be well earthed up as the plants grow, that they may not be too much shaken by the wind.

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[1] Johnston's *Chemistry of Common Life*, vol. i. pp. 121, 122.

The varieties of *Brassica oleracea*, which are cultivated for the sake of their leaves, and have the head open with spreading leaves, are generally known by the names of *Kale*, *Colewort*, and *Borecole.* A variety, with the leaves very much waved and wrinkled, is called *German greens*, and is one of the best of this class. *Milan kale* is a variety remarkable rather for its tall stem, and for the ornamental appearance of its finely-coloured leaves, than for other merits. The varieties in which the leaves *boll*, or gather together into a close head, so that the inner leaves are completely blanched, are called *cabbage.* The *red cabbage* is remarkable for the deep red colour of its leaves, even the inner leaves being red, although the head is close and compact. It is too coarse for use as a boiled vegetable, but is highly valued for pickling. The cultivation of the cabbage is said to have been introduced in the north of Scotland by the soldiers of Cromwell; but some of the kinds of open kale had been in cultivation there long before, and were perhaps introduced by the Flemish fishermen who settled at many places on the Scottish coast. The *savoy* is a cabbage, with leaves much waved and curled like those of German greens, but forming a compact head as in the true cabbage. Its value as a winter vegetable is well known. A peculiar variety, called *Brussel sprouts*, has the stem covered with lateral buds, which form very small compact *cabbages*, whilst the terminal bud, or proper head, does not much exceed them in size. This variety is well known as affording one of our finest winter vegetables. *Cauliflower* and *broccoli* are varieties which have the flowering stem short and succulent, the rudiments of the flowers forming a large curd-like head, which does not rise higher than the leaves before the flower is developed. This is the part which is used for food, and is one of the most esteemed articles of garden produce. It is not only very palatable, but must be regarded as one of the most nutritious of vegetable substances, as, when dried, it sometimes contains 64 per cent. of gluten. The cauliflower is said to have been introduced into England from the island of Cyprus, but at what date has not been ascertained. It was certainly in cultivation in the gardens of the wealthy at the beginning of the seventeenth century; but it was not till the end of that century that it began to be common in the market, and even then it bore a high price. It became, however, a chief subject of attention to English market gardeners, and, until intercourse with the continent was cut off by the wars of the French Revolution, cauliflowers were regularly exported from England to Holland, Germany, and France; and to this day English cauliflower seed is in high repute in these countries. Broccoli—which may be considered a sub-variety of cauliflower, but is more hardy, and can often be procured during the winter months or in early spring, when the weather is open—is of comparatively recent introduction. *Kohl rabi*, or *turnip cabbage*, is a variety in which the stem swells out like a turnip just above the surface of the ground, leaves radiating from it, and a crown of leaves surmounting it. It is a plant of remarkable and rather beautiful appearance, and the swollen part of the stem is an excellent article of food, which is prepared for the table in the same way as the turnip. It is to be observed that it differs essentially from the turnip in being a swelling of the stem and not of the root. It is also more solid and compact than any kind of turnip. In Britain kohl rabi is little cultivated, and only in gardens; in Sweden it is common as a field crop, and has the advantage of great hardiness, resisting the most severe frosts of a Swedish winter. The author once prevailed on a farmer in the south of Scotland to try a few rows of kohl rabi in a field, and the crop was very good; but the field was on a road-side, so that passers-by, attracted by the peculiar appearance which it presented, went into the field to examine it, and the examination being carried to the length of pulling a plant and applying the knife, the taste was so agreeable to the rustic palate, that the farmer's cattle received only a small share.

Sauer-kraut is a preparation of cabbage highly esteemed by the Germans, and which the German colonists in America prepare as constantly as their brethren in the Fatherland. The name means sour greens. Great quantities of cabbage are used in Germany for making sauer-kraut. Close white-headed cabbages are preferred. They are cut in shreds, of which a four-inch layer is placed in a cask; this is sprinkled with salt, unground pepper, and a little salad oil; a man with clean wooden shoes then gets into the cask and treads the whole together till it is very compact. Layer is added after layer, the same processes being repeated till the cask is filled. The whole is then subjected to heavy pressure, and allowed to ferment; when the fermentation has subsided, the barrels are closed up, and the sauer-kraut preserved for use. Every German family stores up sauer-kraut in October and November for use during the winter months. The making of sauer-kraut is very much a separate profession, chiefly carried on by Tyrolese, who travel throughout Germany for the purpose during the months already named. Sauer-kraut is generally eaten with boiled pork and mashed potatoes, and as the dish is at once wholesome and delicious, it is surprising that its use should still be so exclusively confined to Germans and families of German origin.

CHAPTER XXXI.

TURNIP.

THE Turnip (*Brassica rapa*) is the most valuable of succulent roots, occupying an important place not only in the garden for culinary use, but also in field culture, as affording winter food for cattle. The introduction of the turnip as a field crop has made a very great change in the husbandry of Britain; and the whole arrangements of the farmer now have reference to his turnip crop.

The turnip is a native of Britain, sometimes found growing in a wild state in cultivated fields; but it is very difficult to tell when the plant is truly indigenous and when it has derived its origin from a cultivated variety, as it soon returns to the wild type. There is no doubt, however, that it is a European plant; but when it was first cultivated is uncertain. It was well known to the Romans, and seems to have been cultivated by them much as it is at the present day. Columella recommends the extensive cultivation of turnips, because those not required for human food could be given with advantage to cattle, and both he and Pliny represent the produce as next to corn in utility and value. The turnips produced by the ancient Romans are said to have been of very great size—weighing forty pounds; so far exceeding those of modern times that there must be supposed to be some mistake or exaggeration in the statement. A warm climate is not so favourable to the cultivation of the turnip as that of cold moist regions; and in Britain no crop succeeds so well on high hilly grounds in a moist climate. The turnip attains a larger size in the north of England and in Scotland than in the south of England, and does better in the humid western parts of Britain than in the east. In arctic countries, however, which have a brief and warm summer, it cannot be advantageously cultivated.

The wild turnip is a plant very similar to the wild cabbage, although not, like it, a native of the sea-shore. The tendency to swelling of the root seems to be one of the most peculiar characteristics of the species, yet in the wild state it hardly appears.

The culture of the turnip seems to have been introduced into Britain by the Romans. It was probably carried on during all the centuries of warfare which ensued on the departure of the Romans. It is not till the sixteenth century, however, that we have clear evidence of the culture of the turnip in Britain, and then it was only in gardens. The introduction of the turnip as a field crop cannot be referred to an earlier date than the end of the seventeenth century. It was in the earlier part of the eighteenth century that it began to be extensively cultivated in Norfolk and some other parts of England, and towards the end of the century that its cultivation was introduced into Scotland, where now it is a principal crop of every farmer.

The turnip is cultivated in all parts of Europe, and generally in all temperate parts of the world. Its cultivation extends even into arctic and tropical regions. A plentiful crop of small turnips is often obtained in gardens in Lapland, and the Laplanders esteem them as one of their chief luxuries. In Russia, also, they are used by all classes as fruit is elsewhere used, and slices of raw turnip are handed round on silver salvers, in the houses of Russian nobles, accompanied with brandy as a provocative to appetite before dinner. In some parts of India turnips are grown and exposed for sale in the bazaars, chiefly for European purchasers, who from old associations and early acquired taste, prefer them to the finest productions of the tropics.

The turnip is a biennial plant, sending up a flower-stem and producing seeds in its second year; but the swollen root is produced in the first year, and plants which send up a flower-stem when still young—as is apt to occur in dry summers—are useless to the farmer or gardener. Turnips sown too early in spring are almost sure to do this; and both the farmer and gardener are careful to adapt the time of sowing to the climate and locality. It does not belong to our purpose to describe their methods of cultivation, nor to take notice of the many varieties of this valuable plant. The kinds cultivated in the garden for culinary use are generally much smaller than those used for field crops and the feeding of cattle. They are also of more rapid growth; and the gardener makes successive sowings, so as to have turnips during the greater part of summer and autumn. The farmer, on the contrary, makes one sowing about the middle of June, and begins to use his turnips at the beginning of winter, using those kinds first which are least capable of enduring frost, and which are also of most rapid growth and first ready, but less solid and nutritive than some of the kinds which are kept for subsequent use. Most of the varieties of turnip are nearly globular, but some are much elongated. These, however, are not in general so much esteemed.

The *Swedish turnip* or *Ruta baga* is extensively cultivated in fields for feeding cattle, and is also used for culinary purposes like the common turnip. It is sown earlier than any other kind of turnip cultivated by the farmer, and the crop is used in the latter part of spring, after all the other kinds. The swollen root—which, like that of the common turnip, is often improperly called the *bulb*, being in reality not a bulb, nor at all similar to a bulb in structure—is more solid than that of the common turnip. The Swedish turnip is believed by botanists to belong to a species, *Brassica campestris*, distinct from the common turnip. The species are very similar, much more so to the eye of any one but a botanist than many varieties of *Brassica oleracea;* but they are regarded as distinct, because no intermediate forms have been found, nor does the one appear to pass into the other in any circumstances. The question of distinction of species must rather be determined by facts of this kind than by mere similarity or dissimilarity. *Brassica campestris* is the plant cultivated under the name of *Colza* in France, Holland, and Belgium, for the sake of the oil yielded by its seeds, well known as *Colza Oil,* and much used for burning in lamps.

The root of the turnip contains more than ninety per cent. of water. When dried, however, and made into meal, it is very nutritious; the meal consisting of gluten, starch, and sugar. 'It is recorded, that in the years 1629 and 1630, when there was a dearth in England, very good, white, lasting, and wholesome bread was made of boiled turnips, deprived of their moisture by pressure, and then kneaded with an equal quantity of wheaten flour, the whole forming what was called turnip-bread. The scarcity of corn in 1693 obliged the poor people in Essex again to have recourse to this species of food.'[1] If it were not for the peculiar flavour which it has, turnip meal might be much used as an article of food.

The leaves of turnips are a good kind of greens; and turnip-tops, the first spring shoots of turnips, are much used as greens in England. Those of the Swedish turnip are the best.

The *Navew*, or *French turnip* (the *Chou Navette* of the French), is believed to belong to a species different both from the common and the Swedish turnip, the species of which the most common cultivated variety is known as *Rape* or *Colseed* (*Brassica napus*). The root is of small size in comparison with the turnip, but it has a strong and agreeable flavour, and is, therefore, much esteemed in France and other parts of Europe for flavouring soups. It is also often stewed in gravy, and thus makes an excellent dish. It is little cultivated in Britain, but apparently from a mere caprice of fashion rather than for any other reason. The shape of the root more resembles that of the carrot than of the turnip, but it is white in colour.

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[1] Vegetable Substances used for the Food of Man (*Library of Entertaining Knowledge*), 235, 236.

CHAPTER XXXII.

CARROT.

THE Carrot (*Daucus carota*) belongs to the great natural order *Umbelliferæ*, few species of which are esculents, whilst many are valued for their aromatic seeds, some for their aromatic foliage, and many are poisonous. The carrot is a native of Britain, and of most parts of Europe, growing by waysides and in cultivated ground. The seed-bearing umbels curve in, assuming a nest-like form, so that the wild plant is popularly known as the *Bird's Nest*. It is a biennial; but, like the turnip, it produces its esculent root in its first year. The wild carrot has a slender hard root, of an acrid, disagreeable taste. Few plants have been so much changed by cultivation; but the change is chiefly in the root, the leaves and flowers of the cultivated carrot being much the same as those of the wild plant. The carrot seems to have been cultivated by the ancient Greeks and Romans.

It does not appear, however, to have been introduced into Britain by the Romans, nor to have been known in England till the reign of Queen Elizabeth, when it was brought to Kent by some of the Flemings, who sought refuge from Spanish tyranny. Its cultivation soon extended very rapidly ; and it is not only one of our most esteemed culinary vegetables, cultivated in the kitchen garden, but also a pretty common field crop, chiefly used for the feeding of horses, although sometimes also for other domestic animals. The varieties of carrot are very numerous, but not so different as those of the turnip. They may be regarded as forming two classes—the *long carrots*, of which the roots taper from the crown to the point, and the *horn carrots*, of which the root is nearly cylindrical for about three-fourths of its length, and then terminates somewhat abruptly. The smaller kinds, known in garden cultivation as early carrots, are all horn carrots. The kinds used for field culture are long carrots. Horn carrots are ready for use much sooner after sowing than long carrots ; but there is no marked difference of quality, and long carrots are therefore cultivated in gardens for the later crops. The carrot is generally of a deep red colour ; but there is a kind of long carrot which is white, and is of very good quality and delicate flavour. The carrot is most successfully cultivated in a light rich soil, which is all the better of being somewhat sandy; but excellent crops are often obtained in other soils, not very tenacious, and a peaty soil is very suitable. The seeds of the carrot are surrounded with numerous forked hairs, by which they adhere together, so that the sowing is somewhat difficult, and they are usually rubbed together between the hands before sowing, or mixed with fine sand, watered, and turned over with shovels. The seed being broad and very light, so as to be easily carried about by the wind, can hardly be sown except in perfectly calm weather. In the garden a succession of crops is sown from the beginning to the end of spring, and the first crops are generally sown very thick, to be thinned out as soon as the first roots are ready for use in soups or stews. Field crops are sown in Britain about the month of March, and require little subsequent culture except two or three hoeings. Eight hundred bushels of large carrots have been obtained from an acre, although on poor land the farmer must sometimes be contented with two hundred. In order to preserve carrots for winter use, they are stored in a dry place, and, if possible, in sand, in which way they may be kept good for months. The smallest kinds of garden carrots, in full maturity, are only two or three inches long, and about an inch in diameter. The largest kinds are sometimes two feet in length, and fully three inches in diameter at the thickest part, weighing about four pounds. The carrot is very nutritious; it contains crystallizable and uncrystallizable sugar, a little starch, extractive, gluten, albumen, a volatile oil from which it derives its smell and flavour, vegetable jelly or *pectin*, and a peculiar crystallizable principle without odour or taste, called *carotin*. The expressed juice of carrots, in consequence of the large quantity of sugar it contains, yields, after fermentation and distillation, about twelve gallons of alcohol for every ton of carrots.

Carrots, scraped and made into a poultice, are used as an application to sloughing ulcers; and when boiled and washed, they make a mild emollient cataplasm.

In the beginning of the seventeenth century, ladies in England often wore carrot leaves in their hats instead of feathers. An elegant chimney ornament for winter is sometimes formed by cutting off the top of a carrot and placing it in a saucer filled with water, when it sprouts and throws out its beautiful leaves, which may be protected from dust by a glass shade.

CHAPTER XXXIII.

PARSNIP.

THE Parsnip (*Pastinaca sativa*) is another umbelliferous plant, cultivated for the sake of its root, which is similar in form and generally in size to the long kinds of carrot. It is, like the carrot, a biennial, but differs very much from it in foliage and general appearance. It is a native of Britain, and is found wild in meadows and pastures in most parts of Europe. In its wild state the root is white, aromatic, mucilaginous, and sweet, with some degree of acrimony, and is not very wholesome, but apt to cause vertigo and other disorders. By cultivation it has increased very much in size, and lost its acrimony. It has a peculiar flavour, disliked by some, but much relished by others, and is wholesome and highly nutritious. The varieties cultivated in Britain are numerous, but do not differ very considerably. In France and in the Channel Islands varieties much more distinct are in cultivation. A kind, called the *Coquaine*, attains a remarkable size, the root running to the depth of three or even four feet into light deep soils, and being sometimes from three to four inches in diameter at the thickest part. The leaves also are large, and grow to a much greater height than those of the ordinary kinds.

The parsnip succeeds best in a light deep soil. The seed is sown early in spring. The roots are not used till after the frosts of winter have set in ; and it is not an uncommon practice of gardeners to dig them, and expose them on the surface of the ground for a few days to be mellowed by frost. Parsnips grown on poor soils are smaller in size, but better in quality than where the soil is rich. In the north of Scotland, parsnips are often mashed with potatoes and a little butter. In times of scarcity bread has been made from them. An agreeable beverage, called *Parsnip wine,* is made from them in the north of Ireland ; and a very good spirituous liquor is obtained by distillation. The parsnip was, however, more esteemed in former times than it is at present. In Roman Catholic countries it is much used with salt fish in Lent. It has never been largely cultivated as a field crop, although both oxen and horses eat it with avidity, and thrive well upon it. It was cultivated by the ancients, and has been in cultivation in Britain from the earliest historic times.

CHAPTER XXXIV.

BEET.

THE Common Beet, or Red Beet (*Beta vulgaris*), is a native of the south of Europe, and belongs to the natural order *Chenopodiaceæ*, an order of exogenous plants, to which also spinach belongs, and of which many species are, like the spinach, useful for their bland, esculent foliage. Beet, however, is cultivated chiefly for its large spindle-shaped or carrot-like root, which is very rich in sugar; and in the varieties preferred for the garden is of a deep red colour, whence the name *Red Beet.* Beet was cultivated as an esculent root by the Romans, and is accurately described by Pliny. It was probably introduced into Britain by the Romans; but all we know on the subject is that it was cultivated at Lambeth by Tradescant the younger, in 1656.

Beet is a biennial plant, with large ovato-lanceolate leaves, and in its second year sends up a tall straight stem, slightly branching, and producing many clusters of very small flowers. A wild species, *Beta maritima*, is found in some places on the shores of Britain. It has nothing of the red colour characteristic of the most esteemed garden kinds, and has not a large and succulent root; but the botanical characters are so much the same, that there is perhaps no essential distinction. Intermediate between these two kinds is the *White Beet* of our gardens (*Beta cicla*), which also has a greenish white colour, and a small hard root, and is cultivated for the sake of its leaves. The *Sugar Beet*, very extensively cultivated on the continent of Europe on account of the sugar obtained from its large succulent roots, and the *Mangold*, or *Mangold Wurzel*, also extensively cultivated for its roots, but in order to the feeding of cattle, are very doubtfully referred to one or other of these supposed species, and may be regarded as connecting links between them.

Red beet is sufficiently hardy for the climate of most parts of Britain. It is generally sown pretty early in spring, and the roots are taken up and stored before severe frost comes. The root is very nutritious. It is used as a boiled vegetable; although, as when warm, it has a somewhat mawkish taste, it is more generally allowed to cool, and is then cut into slices, and vinegar is poured over it.

How pleasant it is when thus prepared most people know.

In digging beet, care must be taken not to wound the root, as in that case it bleeds, and loses great part of its juice, and along with the juice its deep red colour, and, in great part, its best qualities.

CHAPTER XXXV.

OTHER ESCULENT ROOTS.

THERE are many other roots, belonging to plants of different natural orders, which are used in the same way as those already noticed, although of less importance. A few of them must be mentioned.

Skirret (*Sium sisarum*) is an umbelliferous plant, a perennial, with pinnated leaves, supposed to be a native of China, but which has been in cultivation in the gardens of Europe for many centuries, for the sake of its roots. The roots are long and slender, like small fingers, and grow in a cluster. The plant is easily cultivated, and may be propagated either by seed or by parting the roots. It is a small plant in comparison with the carrot or parsnip, but yields a fair crop in a good soil, being planted in rows much closer than those of the larger plants. Skirret was in former times much more highly esteemed than it now is. The Emperor Tiberius caused it to be brought from the banks of the Rhine for the use of his table; but how it had got to the banks of the Rhine is a question not easily to be answered. An English writer, of the latter end of the seventeenth century, describes it as 'the sweetest, whitest, and most wholesome of roots.' It is now little cultivated in Britain, the extreme sweetness and mucilaginous character of its roots being generally disliked, although in some parts of Europe it is still cultivated. In the north of Scotland it is known by the name of *Crummack*. It was long cultivated in such remote parts, after it had almost disappeared from the gardens of the opulent. Skirret abounds in sugar, of which Markgraaf extracted an ounce and a half from a pound of the root, and found it little inferior to that of the cane.

Scorzonera (*Scorzonera Hispanica*) is a plant of the great natural order *Compositæ*, a native of Spain. It has long been cultivated in Britain and throughout most parts of Europe, but is much less common in kitchen gardens now than it once was. Its root, however, is of a very delicate flavour, and is therefore highly esteemed by some. The root is spindle-shaped, but long, and seldom thicker than a finger, covered with a dark-brown skin, white within, and containing a milky juice. The stem is from two to three feet high, and the flowers are yellow. The root-leaves are linear and pointed, about eight or nine inches in length. The stem-leaves are comparatively small, becoming smaller towards the top of the stem. Scorzonera is a perennial plant, but is best cultivated by propagation annually from seeds, as the offsets degenerate both in size and quality. It first came into notice in Spain in the sixteenth century, as an antidote to the poison of snakes, whence its name,—*scurzo* being the Spanish for snake. For this imaginary value it attained high celebrity, but soon fell again into disrepute. It was probably in Spain that it first came into use as an esculent, and it was introduced as such into France at the beginning of the seventeenth century, and soon after into England.

Other species of *Scorzonera* are also of some value for their esculent roots. The roots of *S. deliciosa*, preserved with sugar, are a favourite luxury at Parma; and those of *S. tuberosa* are eaten by the Calmucs.

Salsify (*Tragopogon porrifolium*) is another plant of the natural order *Compositæ*, cultivated for its succulent roots. It has long tapering roots, larger and thicker than those of Scorzonera, but of very similar quality, and the mode of cultivation is similar. It is a native of the south of Europe, very rare in Britain, although found in the south of England. It is sometimes called the oyster plant, because its roots, cut into pieces and cooked in a particular manner, are thought to have a flavour resembling that of oysters. Salsify has been long in cultivation, and is still frequently, but not very generally cultivated. The garden, however, yields few esculents more delicate in flavour. The plant somewhat resembles the leek in its foliage ; but its flower-stem bears a single flower, or rather a single head of dull purple florets. Very similar to it is another species of the same genus, the common goat's-beard (*T. pratense*), not uncommon in England. The young shoots of both species may be used like asparagus, and are a pleasant substitute for it.

CHAPTER XXXVI.

SPINACH, ETC.

SPINACH (*Spinacea oleracea*) is a plant of the natural order *Chenopodiaceæ*—the same order already mentioned as producing Quinoa—but of which the greater number of species are chiefly characterized by the mucilaginous and bland character of their foliage. Spinach is supposed to be a native of the west of Asia, although its native country is not certainly known. It is mentioned in the works of some of the Arabian physicians, on account of supposed medicinal properties, and appears to have been introduced into Spain, and afterwards into other parts of Europe, during the middle ages, as a pot-herb. It was in common cultivation in England in the end of the sixteenth century.

Spinach is an annual, with large and succulent leaves. One variety has the leaves arrow-shaped and rough; another has them roundish and smooth.

These varieties have been constituted into distinct species by some botanists, the smooth variety being called *Spinacia glabra;* but the difference between them is not wide, and does not seem to be permanent. The kind called *Flanders spinach*—one of the best in cultivation—seems to be intermediate between the two common varieties, which are popularly known as *winter spinach* and *summer spinach;* the former, the rough-leaved kind, being sown in autumn, for use in spring; the latter in spring, for use in summer. Spinach is cut for culinary use before the flower-stems begin to show themselves. After they are developed it becomes useless. It succeeds best in moist weather. In dry weather it runs to flower before the leaves attain a considerable size, and the plants are small. In favourable circumstances, it throws up flower-stems of two or three feet in height. It is *dioecious;* that is, the male and female flowers are produced by distinct plants, as in the date-palm.

Spinach is prepared for the table either by boiling it with a little water, or by frying it with a very little butter. In either way it makes a very pleasant dish; but the quantity of leaves consumed to make a small dish is very large.

There are many plants of which the leaves have qualities similar to those of the spinach. Some of these belong to the same natural order. One of them is *Chenopodium Bonus Henricus*, popularly known by the names of Wild Spinach, English Mercury, and Good Henry or Good King Harry. It is found wild in loamy soils, by waysides and among ruins, in many parts of Britain. It is a coarser-looking plant than spinach, has rather large arrow-shaped leaves, and flower-stems which rise to the height of a foot and a half. It is a perennial. The young leaves are used as a substitute for spinach in some parts of England, and the plant is cultivated in some places, particularly in Lincolnshire, where it is very generally preferred to spinach.

A plant still more similar to spinach is the Garden Orache (*Atriplex hortensis*), which was formerly cultivated to some extent in English gardens, but it is now unaccountably neglected. It is a native of the south of Europe. Very similar to it is a species of orache which is a very common weed in Britain (*Atriplex patula*). Few seem to be aware that this plant is good for the table; and although it springs up in great abundance in gardens, it is commonly plucked out as a mere weed. The foliage, however, when the plant is young, makes a dish not easily to be distinguished from spinach.

New Zealand Spinach (*Tetragonia expansa*) is a species of a small and somewhat peculiar natural order called *Tetragoniaceæ.* It is a native of New Zealand, and was recommended for cultivation as an esculent by the naturalists who accompanied Captain Cook in his voyage of discovery. Sir Joseph Banks first cultivated it in England in 1772. It was at first treated as a greenhouse plant, but grows freely in the open garden in the south of England, and in some places of the south-west is almost if not completely naturalized. It is in appearance very different from spinach, being a plant of spreading habit, with thickish stems and branches, triangular succulent leaves, and small axillary yellow flowers. The whole plant is studded with

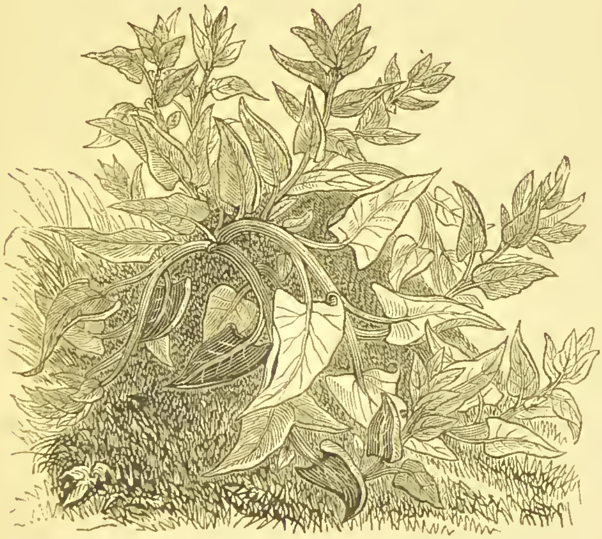

FIG. 18.—NEW ZEALAND SPINACH.

minute watery tubercles, of the same nature with those of the Ice Plant. It is of very rapid growth, and a bed of about twenty plants will supply the wants of a family. The plants, however, must be placed widely apart. In the northern parts of Britain, New Zealand spinach is raised on a hot-bed, and planted out. It yields abundant produce during the hot months of summer, when common spinach cannot be obtained. It is the only Australasian plant which has been introduced into the horticulture of Britain.

Two species of the same natural order, *Sesuvinm portulacastrum* and *S. rapens*, are used as pot-herbs in the West Indies. Allied to it, and to *Chenopodiaceæ*, is another small order called *Basellaceæ*, to which belong *Basella rubra, B. alba,* and *B. cordifolia,* all of which are used in India as spinach.

This may be a proper place to mention one or two common British plants which are very good for use as boiled vegetables, although almost entirely neglected. One of them is the Chickweed (*Stellaria media*), of the natural order *Caryophyllaceæ,* which, when growing in a moist place and luxuriant, is extremely tender and pleasant, not easily to be distinguished in flavour from spinach. Another is the Sow Thistle (*Sonchus oleraceus*), of the natural order *Compositæ,* which is used to some extent as a pot-herb in Sweden, although entirely neglected in Britain. Those who have good opportunity might at least amuse themselves by making a trial of these very common plants.

CHAPTER XXXVII.

ASPARAGUS AND SEA-KALE.

ASPARAGUS (*Asparagus officinalis*) is rather one of the luxuries yielded by the kitchen-garden, than an esculent valuable as affording part of our food supply. For its cultivation, to yield a crop sufficient for the table of an ordinary family, a much greater extent of ground is required than for almost any other kind of kitchen-garden crop. It has, however, been long in cultivation; it was much esteemed by the ancient Romans; and the mode of its cultivation, as described by Pliny, agrees very nearly with the most approved practice of the present day. For example, Pliny recommends the liberal application of salt as a manure; and nothing is found more beneficial, asparagus being a plant of the sea-shore, and generally growing in a wild state within the reach of the sea spray. It is a native of the coasts of many parts of Europe, and is found in some places on those both of England and Scotland, as in the fens of Lincolnshire, and in an island called Asparagus Island, at Kynance Cove, in Cornwall. Asparagus is an endogenous plant of the natural order *Liliaceæ*, agreeing with the lilies in its botanical structure, although extremely different from them in the size of its flowers, and in its general appearance. It is a perennial plant sending up annual stalks. The part used for the table is the young shoot, gathered almost immediately after it has come above ground. It has a very delicate and peculiar flavour. There are several varieties in cultivation, of which one, called Giant Asparagus, is remarkable for its great size. The best mode of propagating asparagus is to raise it from seed; but the plants are two or three years old before they begin to yield shoots fit for the table. Of the shoots produced, a portion only must be gathered, or the plants would be weakened, so as to be unproductive next year.

Market gardeners generally gather all the shoots that spring up for about two months, from April to June; and then, when green peas begin to come in, and take the place of asparagus in the market, they leave all to grow.

Asparagus requires a light rich soil, and succeeds particularly well where the soil is sandy. The ground ought to be deeply trenched before it is planted, and enriched with a plentiful supply of stable manure.

Asparagus is usually planted in beds about four feet wide, and in rows about nine inches apart. It is advantageous to cover the beds during winter with rotten manure, which is forked in, and the beds raked in spring. Whole fields of asparagus are cultivated by market gardeners in the neighbourhood of London.

Asparagus is a very beautiful plant, too well known, however, to require description. Its graceful feathery appearance would secure it a place in the flower-garden, if the kitchen-garden had not a claim to it. The juice contains a peculiar crystallizable principle called *asparagin*, which has medicinal properties.

Sea-Kale (*Crambe maritima*) is a plant very different from asparagus in appearance and in botanical affinities, being an exogenous plant of the natural order *Cruciferæ*, and of the same tribe with the radish. It is a hardy perennial, a native of the sea-shores of Britain and the continent of Europe. The root-leaves are large, of a rounded form, waved, deeply notched at the edges, and have very thick stalks and midribs. The flowering stem is not tall, but much branched, producing a great number of white flowers with a honey-like smell. The general colour of the foliage is a delicate sea-green with a tinge of purple. Sea-kale is propagated either by seed, or by parting the roots. It requires a deep rich soil, and a sandy soil is to be preferred. A bed of it continues productive for many years, and yields a much more abundant crop than a similar extent of ground planted with asparagus. The young root-leaves, before the blade is developed, are the part used; but they are only fit for use when blanched, as they acquire a strong disagreeable flavour when they become coloured by exposure to the air. They are taken off by the very base, and the lower part of the stalk is naturally blanched in the soil; but the gardener secures a further blanching, and causes the stalk to elongate without developing its blade, by various artificial means, as by heaping earth, sand, or sawdust over the plants, through which the leaves must force their way upwards, or by covering them with litter, with large flower-pots inverted, or with a particular kind of pot made for the purpose. Litter and manure are often heaped around the whole, so as to make a kind of hot-bed for the forcing of sea-kale, that it may be obtained very early in spring.

The cultivation of this delicious vegetable is almost entirely confined to Britain. It was long much sought after by the inhabitants of the sea-coast in some parts of England, where its shoots were naturally blanched in rising through the sand; but its cultivation was never attempted till 1767, when the attention of Dr. Lettsom, an eminent physician and botanist, was attracted to it at Southampton, and he gave some of the seed to Mr. Curtis, the originator of the *Botanical Magazine*, by whom it was introduced into cultivation and brought into notice. It soon attained the popularity which it so well deserves.

CHAPTER XXXVIII.

ARTICHOKE, ETC.

THE Artichoke (*Cynara scolymus*) is another plant cultivated as an article of luxury rather than of food. It belongs to the natural order *Compositæ*. The part used is the *receptacle*,—the *bottom* of the head of flowers,—the same part which in the thistle (*Cnicus lanceolatus*) children call the *cheese*, and which they often eat in a raw state. The artichoke is a native of the south of Europe, and has been in cultivation at least since the end of the fifteenth century. Its cultivation seems to have been first attempted in Italy, and to have been introduced into France about the beginning of the sixteenth century, and soon after into England. In the reign of Henry VIII., there are entries in the Privy-purse expenses of the king concerning artichokes, as, 'Paid to a servant of the maister Tresorer in rewarde for bringing Archechokks to the King's Grace to Yorke Place, iiijs., iiijd.'[1] The artichoke is a perennial plant somewhat like a thistle, with thick roots and annual stems, which rise to the height of three feet or more. It has large pinnatifid leaves, with deep convex segments covered with an ash-coloured down. The stem is branched, and bears large scaly heads of flowers, the scales of which are very large, and the bases of the scales are fleshy, and even more delicate than the receptacle itself. The artichoke is generally propagated by offsets from the roots of old plants; and the plants continue productive for six or seven years, if the ground is properly digged and manured. Artichokes have been kept productive for twenty years; but the number and size of the heads decrease when it is attempted to keep the plants to any such age.

To the same genus with the artichoke belongs the Cardoon (*Cynara cardunculus*), said to be a native of Crete, and to have been introduced into England about the middle of the seventeenth century. It is much more cultivated in some parts of the continent of Europe than in Britain. The edible part is the leaf-stalk of the young leaf, improved by blanching, which is used in soups and stews. It is called the *chard*. The cardoon much resembles the artichoke, but is a larger plant and spiny.

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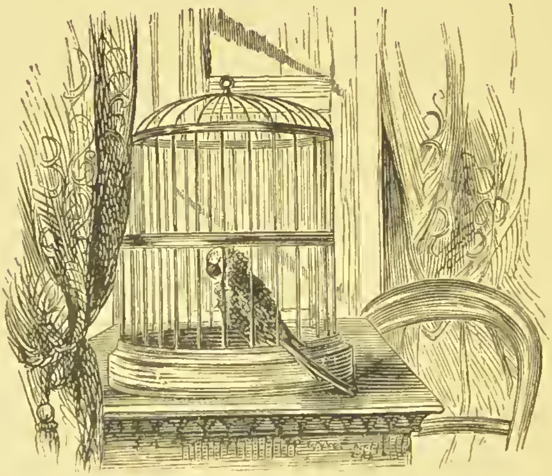
[1] *Vegetable Substances used for the Food of Man*, 'Library of Entertaining Knowledge,' p. 282.

CHAPTER XXXIX.

OCHRO.

H*IBISCUS esculentus,* also known as *Abelmoschus esculentus,* is a plant of the natural order *Malvaceæ.* It is the *Ochro* or *Okro* of the West Indies, the *Gourbaud* or *Gourbo* of the French tropical colonies, and is called *Bandikai* at Madras, and *Ram turai* or *Dhenroos* in Bengal. This plant is cultivated as a pot-herb in all tropical and subtropical countries, and is one of the most valuable plants of its kind. The part used is the long pyramidal seed-pods, gathered when green, which are mucilaginous and very nutritious, and form a jelly with water. They are used for thickening soups, or when buttered and spiced, form an excellent dish. The seeds are used in soups as barley, and, when roasted, as a substitute for coffee. The unripe seed-vessels are boiled in water, dried a little, and allowed to cool, cut across, placed in layers, vinegar and oil poured over them, and seasoned with pepper and salt, or are eaten with gravy. The seed-vessels or pods are from two to six inches long. They are a chief ingredient in the *pepper-pot* of the West Indies.



CHAPTER XL.

ALLIACEOUS PLANTS.

ALLIACEOUS plants are distinguished by a peculiar flavour and odour, owing to the presence of an essential oil, which contains sulphur and phosphorus amongst its constituents. The alliaceous odour and flavour are found in plants of very different natural orders, but are particularly prevalent in the genus *Allium*, a genus of endogenous plants of the natural order *Liliaceæ.* The species of this genus are numerous, and are widely diffused over the temperate and colder parts of the northern hemisphere. They are mostly bulbous-rooted perennials, some of them biennials. Their flowers are generally in umbels, enclosed in a spathe, and are small in many of the species; in some they are comparatively large, and may almost be called beautiful. The wild *ramsons* (*Allium ursinum*) of our groves and thickets would be attractive from the beauty of their flowers, if their smell did not repel the flower-gatherer. In every species of *Allium* the alliaceous odour pervades all parts of the plant; and where any of the species grows in pastures, the milk of cattle grazing in them partakes of it very unpleasantly. The umbels of many species contain small false bulbs among the flowers. The leaves of most of the species are narrow, although some, as *ramsons*, have broad leaves; those of many, as of the onion, are rounded and fistulose. Eight or nine species are natives of Britain.

The most important plants of this genus are the onion (*Allium cepa*) and the leek (*A. porrum*), both of which are not only used for flavouring, but as articles of food, being very nutritious. The dried bulb of the onion contains from twenty-five to thirty per cent. of gluten, and the onion therefore ranks among the most nutritious productions of the vegetable kingdom. 'It is not merely as a relish, therefore, that the wayfaring Spaniard eats his onion with his humble crust of bread, as he sits by the refreshing spring; it is because experience has proved that, like the cheese of the English labourer, it helps to sustain his strength also, and adds—beyond what its bulk would suggest—to the amount of nourishment which his simple meal supplies.'[1]

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[1] Johnston's *Chemistry of Common Life*, i. 119, 120.

The onion is supposed to be a native of India, and from thence to have been brought to Egypt, where it became an object of worship. From Egypt it seems to have been transmitted to Greece, to Italy, and afterwards to all parts of Europe. It has been cultivated from time immemorial, and was probably introduced into Britain by the Romans. The varieties in cultivation are very numerous. Some of them have large bulbs, as the Portugal onion, extensively imported into Britain from warmer countries, and often about three inches in diameter; whilst others, as the silver-skinned onion, much used for pickling, are small, the diameter seldom more than half an inch. In warm countries onions are more mucilaginous, and have less pungency than in colder climates. Thus the Portugal onion, which we import, has a milder alliaceous flavour than any onions produced in this country; and is often presented at table as a separate dish, to be used along with meat, whilst home-grown onions are only used in soups, sauces, or stews. Onions and other alliaceous plants, used in moderate quantity, are beneficial in promoting digestion, but in excessive quantity they cause flatulence, gastric uneasiness, and feverish excitement.

The onion is a biennial plant. The leaves are fistulose; the flowers small, in globose umbels, which are not bulbiferous. There is a variety called the

Tree onion, which produces a cluster of small bulbs at the top of the stem. It is rather cultivated as an article of curiosity than for any value that it possesses. Another variety, the *Potato onion,* produces a cluster of bulbs at the root. It is not uncommon in the gardens of Britain.

The onion requires a good soil, well pulverized and manured. In Britain, the seed is generally sown in March, and the thinnings of the crop are used for flavouring soups as soon as they can be obtained, and whilst the bulb has not yet begun to be formed.

The leek (*Allium porrum*) is a native of the south of Europe, and has been in cultivation from very early times. When it was introduced into Britain is not known, but probably it was by the Romans. It has long been a particularly favourite vegetable in Wales, and has become the badge of the Welsh. The leaves of the leek are narrow and flat, not fistulose like those of the onion. There is almost no bulb. The flowering stem is tall, and is crowned by a large globular umbel of many small flowers. The leek is a biennial, and is generally sown about the same time with the onion, and cultivated in a somewhat similar manner, but with a view to use during winter and spring. It is much improved by blanching, and in order to this the rows are earthed up from time to time. With due care the leek grows to a size far beyond that which it has in a state of nature, increasing especially in thickness, whilst at the same time it becomes more tender and valuable as a vegetable. It is not an uncommon practice to transplant leeks from the seed-bed into holes made by the dibble, at the bottom of which their fibrous roots are covered with soil, whilst the plants stand in a kind of open cup. In this way very large leeks are produced. The leek, like the onion, is not merely used for flavouring, but often as a substantive article of food. It is particularly valuable as being ready for use at the season when other vegetables are least abundant. Leek soup is a favourite dish in Scotland.

Garlic (*Allium sativum*) is a native of the countries on the shores of the Mediterranean. It has long narrow leaves, and bulbiferous umbels. The root is perennial, and is composed of a number of small bulbs, from twelve to fifteen, called *cloves,* enclosed in a membranous tunic. The whole plant has a very strong smell, which to many people is offensive; but it is greatly esteemed by others, and is used for flavouring soups and stews. In Spain almost every dish is flavoured with garlic. The cloves are the only part used. Garlic was more in use in Britain in former times than it is at present. In moderate quantity it stimulates the action of the stomach, and promotes digestion; but by the use of it the breath and even the perspiration are affected with its odour.

Rocambole (*Allium scorodoprasum*), a native of the south of Europe, is cultivated for the same use as garlic; but its bulbs are milder in flavour, and contain more sugar, which is present in greater or less quantity in all the alliaceous plants. The Shallot (*A. ascalonicum*) is a native of Syria and Palestine. It has long been cultivated in Britain, and is supposed to have been introduced by the Crusaders. It very much resembles the onion, but is of smaller size, and produces a cluster of bulbs at the root, which are the part chiefly used. The Chive (*Allium schœnoprasum*) is a small plant, a native of Siberia and of some parts of Europe, a somewhat doubtful native of Britain. It is a perennial plant, growing in grass-like tufts, and has long, slender, pointed leaves. The flower-stalks are only a few inches in height, and bear umbels of purplish white flowers. The chive is to be seen in cottage gardens in most parts of Britain. It is perhaps the finest in flavour of the whole genus to which it belongs. The leaves are the part used; and when the plant is cut over, they soon grow again. The Welsh Onion (*Allium fistulosum*), also called the Cibol, is a perennial, a native of Siberia, much larger than the chive, but cultivated and used in a similar manner. It has a very strong flavour, but is of some value, as its leaves are to be obtained very early in spring. *Allium tuberosum* and *A. leptophyllum* are species of this genus used in India.

Alliaria officinalis, also called *Erysimum alliaria*, is a plant of the natural order *Cruciferæ*, a native of Britain, growing in hedge-banks and waste places. It has a branched stem, two or three feet high, large heart-shaped leaves, and white flowers. All parts of the plant have a strong garlic-like odour. It is a good esculent vegetable, although generally neglected and never cultivated. It is sometimes designated in books of botany Garlic Hedge-Mustard, but is popularly known as *Sauce Alone*, or *Jack by the Hedge.*

CHAPTER XLI.

SALADS.

SALAD plants are plants that are eaten raw, either in their natural state or blanched. They are very numerous—so numerous that only a few of them can be specially noticed—and differ very much, not only in their botanical affinities, but in their qualities, some being bland, as the lettuce and endive; some pungent, as the various kinds of cresses; and some having peculiar flavours, as celery and angelica. They are generally regarded as not very nutritious, although in respect of some of them this may be doubted, but as a mere pleasant addition to a meal. It is an addition, however, which is often of benefit, promoting the better digestion of the whole. Salad plants are very generally used separately in this country; whilst on the continent salads are prepared for the table by a mixture of different kinds, minced into small pieces, with oil, vinegar, salt, and pepper.

One of the principal salad plants is the Lettuce (*Lactuca sativa*). It belongs to the natural order *Compositæ*, and has oblong erect leaves, a long leafy branched flowering stem, and very small heads of flowers. It is supposed to be a native of the East Indies; but has never been found in a wild state, and may, perhaps, be a plant much altered by cultivation. It has been cultivated from a very early date, and is mentioned among the luxuries provided for the table of Henry VIII. of England, in 1530. There are many varieties; but they are divided into two classes—*Coss Lettuces* and *Cabbage Lettuces*, the former of which have the leaves spreading, and in order that they may be blanched, must be tied up by the gardener, whilst the latter fold themselves closely together, and *boll* like the cabbage. Coss lettuces are said to derive their name from the isle Cos, in the Grecian Archipelago, and to have been introduced from it into England. The culture of the lettuce is very simple. It is an annual, and is ready for use within a very short time after the seed is sown. Some of the coarser and more hardy kinds are sown late in summer, and planted out at the beginning of winter, for use in spring. A severe winter destroys them, but in ordinary seasons this practice is successful. The lettuce has a milky juice, most abundant at the time of flowering, which possesses medicinal properties; and from it a substance called *Lactucarium* is obtained, by cutting off the tops of the plant when in flower, collecting the juice which exudes, and inspissating it by a moderate heat. This substance—which mainly depends for its qualities on a principle called *Lactucine*—is narcotic, diuretic, and gently laxative. It has been used to some extent as a substitute for opium, and was first recommended to attention by Dr. Duncan of Edinburgh. There can be no doubt that the usefulness of the lettuce as a salad, and particularly at supper, depends in some measure on the presence of this narcotic substance. 'Eaten at night, the lettuce causes sleep; eaten during the day, it soothes and calms, and allays the tendency to nervous irritability.'[1]

Lactuca virosa, the common wild lettuce of Britain, yields *Lactucarium;* but its foliage, instead of being mild and bland, like that of the garden lettuce, is acrid and poisonous. *Lactuca taraxifolia*, a native of Guinea, is much used by the negroes as a salad plant, and its juice as an opiate.

Endive (*Cichorium endivia*) is another plant of the natural order *Compositæ*, much used as a salad, although not so generally and extensively cultivated as the lettuce. It is an annual, hardy enough to endure the most severe winters of Britain, although supposed to be a native of the East Indies. It is much cultivated in China and Japan. The time of its introduction into the gardens of Europe is not known, but is at least as early as the beginning of the sixteenth century. Many leaves arise from the crown of the root. They are large, smooth, much lobed, and toothed on the edge. The flowering stem rises to the height of two feet, and the flowers are pale blue. The leaves are used, like those of the lettuce, before the flowering stem begins to appear. They are blanched by tying them together. Endive may be obtained, by sowing at proper times, almost during the whole year, but is particularly valuable as a salad in winter and spring, when the garden produces no other salads.

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[1] Johnston's *Chemistry of Common Life*, ii. 100.

Chicory, or Succory (*Cichorium intybus*), is a plant of the same genus with the endive. It is a perennial, a native of many parts of Europe, and not uncommon in England, especially on chalky soils. It has a strong, fleshy, carrot-like root ; large leaves, somewhat like those of endive, but feathery at the edges, and having the midrib beset with hairs ; the flowering stem often five feet in height, with large blue flowers of some beauty. Chicory is cultivated for the sake of its root, which is roasted, ground, and used as a substitute for coffee, or for mixture with coffee. It is also cultivated for its foliage, as food for cattle, and as a salad plant for its young and tender leaves, which, however, are fit for use only when blanched. Blanching is accomplished in various ways, chiefly by tying and earthing up ; but a very good way, sometimes practised, is to plant a number of roots of chicory in a large flower-pot, and place the pot in a cellar. The leaves thus produced, are very tender and delicate, and may be obtained in winter.

Very similar in quality to chicory is the Dandelion (*Taraxacum Dens Leonis*, or *Leontodon taraxacum*), a plant of the same natural order, too well known to need any description. The root of the dandelion is sometimes used like that of chicory, as a substitute for coffee ; but the plant is generally neglected, and not used for any purpose whatever. The young leaves, however, if blanched, are a very good salad. Dr. Paterson, in the *Manse Garden*, ridicules the idea of eating dandelion, but the ridicule is absurd. There is no reason why we should not eat what is fit for being eaten, even although the plant be a common weed.

Burnet (*Poterium sanguisorba*) is a perennial plant, a native of Britain, growing in dry soils and upland situations, particularly on the chalky downs of England. It belongs to the natural order *Rosaceæ*, and is a perennial, with stems from one foot to two feet high, pinnate leaves, and round heads of small purplish flowers. The leaves, when bruised, smell like cucumber. They have a slightly pungent taste. Burnet is a valuable plant, as affording food for sheep in the pastures in which it abounds. It is much used in France as a salad plant, under the name of *Pimprenelle*, and was formerly cultivated in England to afford an ingredient for cool tankards. It is, perhaps, now more neglected than it ought to be. It is one of those salads which can be obtained throughout the whole winter.

Garden Rocket (*Brassica eruca*) was introduced into Britain from Austria in 1673, and was cultivated as a salad plant, but has now fallen into entire disuse in this country, its taste and smell being generally disliked, although it is still cultivated in some parts of the continent of Europe. The Rampion (*Campanula rapunculus*), of the natural order *Campanulaceæ*, or Bell-flowers, has a thick fleshy root with milky juice, which is sometimes mixed in salads. It has been long cultivated as a salad plant, both in Britain and on the continent of Europe. It is more in use in France than in Britain. Other species of *Campanulaceæ* are sometimes used as salad plants; but the number of unimportant plants occasionally used as salads in different parts of the world is very large, and it is impossible, within the limits of the present work, to enumerate and describe them. They belong to many different natural orders, Purslane (*Portulaca sativa*), a small annual of the natural order *Portulaceæ*, ought perhaps to be noticed, as its name is familiar to many.

Celery (*Apium graveolens*) is much cultivated as a salad plant, and for flavouring soups and stews. It is also, but less commonly, used to make a separate dish as a boiled vegetable, and is a very excellent one. Celery belongs to the natural order *Umbelliferæ*, and in its wild state, in which it is known by the name of *Smallage*, has a rank smell, with the acrid poisonous qualities so prevalent in this order; but by cultivation it has been rendered mild and sweet, and has an agreeable aromatic flavour. The change effected by cultivation seems to depend mainly on an increase of the cellular tissue of the plant,—its stem, formed by the bases of its root-leaves, greatly increasing in thickness. This is the part of the plant used, before the flowering stem begins to appear; and it is rendered fit for use only by blanching, which is effected by planting it in rows, usually at first placed in the bottom of trenches, and heaping earth around the plants as they grow, so that the edible part of the leaf is drawn up to a length far beyond what it would naturally attain. Celery is a biennial plant, naturally growing in salt marshes and ditches near the sea-side in Britain and on the continent of Europe. The whole plant is quite smooth; the leaves are of a dark green, large, pinnated, with wedge-shaped leaflets, cut and toothed at the point. The stem of the wild plant rises to a height of about two feet; but plants of garden celery, abundantly supplied with manure, and cultivated with great care, have been produced, of which the leaves were four feet long, and the weight of the whole plant about nine pounds.

A variety of celery, called Turnip-rooted Celery, or *Celeriac*, is cultivated to some extent. It has a turnip-like root, which is the part used. It is much more cultivated in Germany than in Britain; and the sliced roots, with oil and vinegar, are highly esteemed as a salad.

Another plant of the same natural order, bearing the name Alexanders (*Smyrnium olusatrum*), was formerly cultivated to some extent in the same way as celery, and for the same uses, but is now almost completely neglected. It grows wild on the sea-shore in some parts of Britain.

Angelica (*Archangelica officinalis* or *Angelica Archangelica*), another of the *Umbelliferæ*, a large plant, a native of the northern parts of Europe, was also formerly cultivated like celery. In Lapland the stalks of angelica, gathered before flowering, are regarded as a great delicacy. It is, however, little cultivated now in Britain, or on the continent of Europe, except for the sake of a much-esteemed sweetmeat, which is made by candying the stalks, and for the flavouring of gin. It has a powerful and very agreeable aromatic flavour.

Some notice must now be taken of the pungent salads, which form a very distinct class, remarkable for the property which they possess in common, although botanically of very different natural orders.

The Horse-Radish (*Cochlearia armoracia*) may perhaps deserve to be mentioned first, as possessing the pungent property in the highest degree, although it is hardly one of the plants commonly designated salads. It is indeed used in a raw state, but almost exclusively as a condiment with roast meat. The part used is the root, which is scraped down as a garnish for meat. The plant belongs to the natural order *Cruciferæ*, of which pungency is a generally prevalent characteristic. This property is due to the presence of a peculiar sulphureous volatile oil, and is to be perceived even in the turnip, cabbage, and other plants which have the cellular tissue most largely developed, and in which a bland mucilaginous character chiefly prevails. The horse-radish is a native of moist meadows throughout Europe; somewhat rare in Britain. It has long been cultivated in our gardens. It has large oblong leaves, sometimes nearly entire, sometimes serrated, and sends up flowering stems eighteen inches or two feet in height, which bear loose panicles of small white flowers. The roots run very deep into the soil, and the plant is not easily eradicated where it has once been established. A sad accident occurred some years ago in the north of Scotland, from roots of the Monkshood (*Aconitum napellus*)—a common plant in flower gardens, but possessing the most deadly poisonous properties—being sent to table instead of horse-radish. Several persons died from eating a very small quantity of the root. The mistake is one, however, which only a very unskilful person could be supposed to make.

The leaves of the Horse-Radish Tree (*Moringa pterygosperma*), a tree of the natural order *Moringaceæ*, are used in the East Indies for the same purpose as the roots of the horse-radish in Europe. They possess the same pungent quality. They are much used in curries.

It is impossible to pass on from the horse-radish to any of the other salad plants, without noticing the Scurvy-grass (*Cochlearia officinalis*), a species of the same genus, abundant on the sea-shores of Britain and of Europe generally, and also often found, like some other maritime plants, in elevated mountainous regions. It is seldom cultivated, being valued for its medicinal properties rather than enjoyed, and naturally abundant where it is most needed. Very similar species, if indeed they are not mere varieties of the same species, occur on the sea-shores of almost all parts of the world. Scurvy-grass is a small plant compared with the horse-radish, and of very different appearance. It is an annual, from six inches to a foot or more in height, much branched, with succulent stalked leaves more or less heart-shaped, and small white flowers. Scurvy-grass has often been found of incalculable value to ships' crews afflicted with that terrible malady sea-scurvy, when the use of lime-juice had not yet been thought of, and before fresh meat and vegetables began to be preserved in tins for sea-stores. Its extensive distribution on the shores of almost all parts of the world has often been remarked as one of the beneficent arrangements of Providence. The reader may perhaps remember what benefit the crews of Lord Anson's ships, in his celebrated voyage, derived from the scurvy-grass which they found on the shores of South America, and how the progress of disease and death was arrested by its use. The pungent cruciferous plants are of especial value as anti-scorbutics, as are also the alliaceous plants, which like them contain a sulphureous volatile oil, very different, however, in its sensible properties. The free use of such plants, either as salads or boiled vegetables, is very beneficial to health; and in some parts of Scotland, where vegetables are little cared for by the people generally, scorbutic tendencies manifest themselves to a degree which the very water-cresses of the neighbouring brooks and ditches would be sufficient to counteract.

The Radish (*Raphanus sativus*) is a well-known cruciferous plant, supposed to be a native of China, but which has been in cultivation in Britain for several centuries. A description of this familiar plant is unnecessary. It may be mentioned, however, that of the numerous varieties in cultivation, some have carrot-shaped and some turnip-shaped roots, but there is little difference of quality. The root, enlarged by cultivation, is the part used, and it is only fit for use whilst the plant is young, before the flowering stem is sent up. The radish is an annual plant of very rapid growth, and the flowering stem appears in a few weeks after the seed has been sown. The green pods (*siliques*) of the radish are sometimes used for pickling.

The name Cress is given to a large number of plants, chiefly of the natural order *Cruciferæ*, the foliage of all of which possesses much pungency. The Garden-Cress (*Lepidium sativum*) is a hardy annual, a native of Persia and the Levant, which has been cultivated in the gardens of Britain since the middle of the sixteenth century. The leaves of some of the varieties are curled, those of others plain. It springs up in a few days after the sowing of the seed, and repeated sowings must therefore be made, as it is only fit for use in a very young state, before the flowering stem appears. It is a favourite salad of early spring ; and along with it *Mustard* is often used,—the seed-leaves of the White Mustard (*Sinapis alba*), a native of Britain, frequent in corn-fields and waste places, which is sown in gardens in order to be cut over and used almost as soon as it appears above ground. Both cress and mustard are often raised in boxes in hothouses before they can be obtained in the open air.

One of the best of the cress kind is the Water-Cress (*Nasturtium officinale*), which grows in rivulets and ditches, and is very common throughout Britain. It is much used as a spring salad in England and on the continent of Europe ; and great quantities are annually sold in London and other English towns, both in the vegetable markets and by hawkers on the streets, chiefly to be used at the tea-table along with bread and butter. It would be well for the health of the inhabitants of many towns and villages of Scotland if the water-cresses of the neighbourhood, generally neglected, were in like manner used. The plant is a perennial, and grows to a considerable length, its stem floating in the water. Its leaves are pinnate, its leaflets ovate, somewhat heart-shaped, and more or less waved and toothed. It has white flowers, which are produced above the surface of the water. The supply of water-cress from natural sources has not been found sufficient for London, and it is cultivated to some extent for the London market, as it is also for some continental towns. For its cultivation, slowly running water is preferred, and a gravelly bottom.

Other species of *Cruciferæ*, known as cresses, must be passed over with very slight notice—as certain species of *Barbarea*, particularly *B. vulgaris* and *B. præcox*, known as Bitter Cress, Winter Cress, American Cress, Belleisle Cress, etc., which are cultivated in some parts of the continent of Europe, because they can be obtained as salads during winter; but have along with their pungency a peculiar bitterness, and a flavour which those unaccustomed to it generally regard as nauseous. In Sweden *B. vulgaris* is used as a culinary vegetable like kale.

Indian Cress (*Tropæolum majus*), sometimes popularly called Nasturtium, is a plant of very different botanical affinities. It belongs to the natural order *Tropæolaceæ*, an order of exogenous plants, with showy, often beautiful flowers. It is, like all the rest of the order, a native of South America. It is familiar to every one as an ornamental plant, and therefore needs not to be further described. It is an excellent anti-scorbutic, and is sometimes used as a salad plant. The unripe seeds, preserved in vinegar, make a good pickle.

There are some salad plants which are valued chiefly for the agreeable acidity of their leaves, and their cooling effects. Among these are several species of Sorrel (*Rumex*), of the natural order *Polygonaceæ.* They are nearly allied to the Docks, although very different in their qualities. It may be enough to notice the Common Sorrel (*R. acetosa*), a native of pastures in Britain, and occasionally cultivated in our gardens, although much more frequently in those of France, where it is used not only as a salad but as a pot-herb. The Wood-Sorrel (*Oxalis acetosella*) belongs to a very different natural order of exogenous plants, *Oxalidaceæ.* It is very common in woods in Britain, forming under the trees a beautiful green carpet of leaves, which have three leaflets, and amidst which rise short slender stalks crowned with beautiful drooping white flowers, with purplish veins. It is one of the finest common ornaments of our woods, not only when in flower in May, but by its foliage during the whole year. The whole plant has a grateful acid taste, and, although little used in Britain, is in some countries an esteemed ingredient of soups and sauces. In Lapland this plant is extremely plentiful; and Linnæus says that the principal vegetables used by the Laplanders are wood-sorrel and angelica.

CHAPTER XLII.

RHUBARB, ETC.

THERE are some plants very similar in their properties to salads, and particularly to those last mentioned, which, however, are generally used in a somewhat different way, the thick fleshy leaf-stalks of their root-leaves being made into tarts like acid fruits. The best known of these, and the only kind cultivated to any considerable extent, is rhubarb. Rhubarb (*Rheum*) is a genus belonging to the natural order *Polygonaceæ*, and therefore allied to docks and sorrels. The roots of one or more species growing in some parts of the East, and imported into this country in a dry state, are highly valued for medicinal purposes ; but the qualities of the leaf-stalks are very different from those of the roots. All the known species are very similar in this respect, and several species have long been cultivated in kitchen gardens, and have been much improved by cultivation; the whole plant increasing in size, and in particular the leaf-stalks, which at the same time become more succulent and delicate. The cultivated varieties are far more numerous than the supposed original species, and some of these are not very widely distinct. One species, *R. palmatum*, sometimes called the True Rhubarb, from the supposition, perhaps incorrect, that its root yields the medicinal rhubarb of commerce, was introduced into Britain from the Levant by Dr. John Hope in 1753, and differs much from all the other cultivated species in having palmated leaves. Its leaf-stalks, however, are comparatively small, and it is therefore little esteemed by the gardener. *R. rhaponticum*, sometimes called Monk Rhubarb, is a native of some part of Asia, although of what part is not known, and has been cultivated in Britain at least from the middle of the sixteenth century. *R. hybridum* and *R. undulatum* are said to be natives of Siberia, and *R. emodi* of the Himalaya. These all have broad, roundish, or oval leaves, and they attain a very large size, with leaf-stalks sometimes eighteen inches long or more, and at the base three inches in diameter. All the species of rhubarb are perennial plants, and send up tall stems, leafy and slightly branched, which produce clusters of small whitish flowers somewhat similar to those of docks.

New plantations are sometimes made by parting the roots, but it is better to make them from seedlings. Rhubarb delights in a rich soil, and can hardly be too much manured. It is often forced in order to produce a supply for the table very early in spring, and this is very generally done much in the same way that sea-kale is forced, the blanching which thus takes place also rendering it more delicate. A very good preserve can be made of rhubarb, in the same way as of gooseberries or apples. A mixture of pieces of ginger greatly improves it.

There is no other kind of plant ordinarily cultivated in Britain for the use of its leaf-stalks like those of rhubarb; but a plant, *Gunnera scabra*, of the natural order *Haloragiaceæ*, has been recently introduced and recommended for cultivation, which is used in the same way in its native country, the isle of Chiloe. It is a very large herbaceous plant, with great broad leaves. Its fitness for the climate of Britain has not yet been fully ascertained; and whether in quality it is worthy to be compared with rhubarb is somewhat questionable. It has a slight, peculiar flavour, not disagreeable, but is deficient in the acidity which is one of the valuable qualities of rhubarb.

The leaf-stalks of various species of the natural order *Begoniaceæ* are used like those of rhubarb in the tropical parts of Asia and America. Dr. Hooker mentions some of the species of *Begonia* as being much used in this way in the Himalayas. They have a very pleasant acidity, and are very delicate. In Britain *Begonias* are only known as hothouse plants. They are herbaceous and half-shrubby plants, with succulent stems and leaves. Some of them are common in our hothouses.

CHAPTER XLIII.

HERBS USED FOR SEASONING.

THERE are many plants, which are of little or no nutritive value, but of which the foliage or other parts are used for seasoning, adding to the pleasantness of soups and other dishes, whilst at the same time they make them more suitable for the stomach, by stimulating digestion. Some of these plants have been in use from time immemorial; and probably their use is almost as ancient as that of the plants which are used as principal articles of food. Medicinal value was formerly ascribed to some of them, which they do not probably possess; but they retain their place for culinary use.

Of all these, Parsley (*Petrosilenum sativum*) deserves to be first noticed, as the most generally used. It is an umbelliferous plant, very nearly allied to celery, but of comparatively small size. Parsley is to be found in every garden of Britain, and therefore no description of it is necessary. It is, however, said to have been introduced so recently as 1548, from Sardinia, of which island, as well as of other parts of the south of Europe, it is a native. Although often cultivated as an annual, it is a perennial plant; and with proper care, plants of parsley will subsist and remain productive for several years. In order to this, the rows of the seed-bed must be thinned, or the plants must be planted out, so that they may have sufficient space for growth. The cultivated varieties are of two kinds, those—least altered by cultivation—which have plain leaves, and those which have the leaves much curled. The former have a considerable resemblance to the leaves of Fool's Parsley (*Æthusa cynapium*), a not unfrequent weed in Britain, and a virulent poison. Death has sometimes occurred from the use of the one by mistake instead of the other, although the botanical characters are so distinct that any one acquainted with them may easily avoid the mistake. A simple rule, however, which prevents all possibility of danger, is to cultivate only the curled kinds of parsley; and, indeed, the most curled kinds are the best in every respect. It may be proper here to observe, that the Fool's Parsley may be readily distinguished by its want of *general involucres* to the umbels, and by its umbellules, or partial umbels, having for involucre three small pendent leaves all on one side. It has also a nauseous smell, very different from that of parsley.

The leaves are the part of parsley generally used; but there is a kind, called Hamburgh Parsley, of which the root is used. The root of Hamburgh parsley has a carrot-like shape, and, in very rich ground, attains a considerable size. It has much of the flavour of the leaves of the common variety, and is chiefly used for soups and stews, more rarely as a separate dish. Hamburgh parsley is more frequently cultivated in Germany and Holland than in Britain.

Parsley is one of the herbs commonly called pot-herbs, because they are chiefly used for flavouring soups.

Another plant used for similar purposes, but much less generally, is Fennel (*Fœniculum officinale*, or *Anethum fœniculum*), also an umbelliferous plant, but very different from parsley in appearance, as it rises to the height of five or six feet, and has leaves much divided into long capillary segments. It is a very beautiful plant, its foliage being extremely graceful, although its small yellow flowers have no claim to regard. The smell of the whole plant is peculiar; by some regarded as pleasant, by others as disagreeable. It is a native of the coast of the Mediterranean, and has been long in cultivation; the foliage being used chiefly for sauces with salmon and other kinds of fish. The stalks of another species or variety, the Sweet Fennel, or Finocchio (*F. dulce*), are earthed up and blanched, like celery, and are used with oil, vinegar, and pepper, as a cold salad, or are put into soups. The seeds are used to flavour tarts, pastry, and dishes of various kinds. They are called *Cose dolce* in Italy, and are there a favourite condiment. Another species, *F. pannorium*, is cultivated in India, and is used as an aromatic condiment. The roots of *F. Capense* are used as an esculent vegetable at the Cape of Good Hope.

Chervil (*Anthriscus cerefolium*) is sometimes cultivated and used in the same manner as parsley. It is an umbelliferous plant; an annual of humble growth; a native of some parts of Europe. Its leaves have an agreeable aromatic odour, and it is used for flavouring soups or stews, and occasionally in salads.

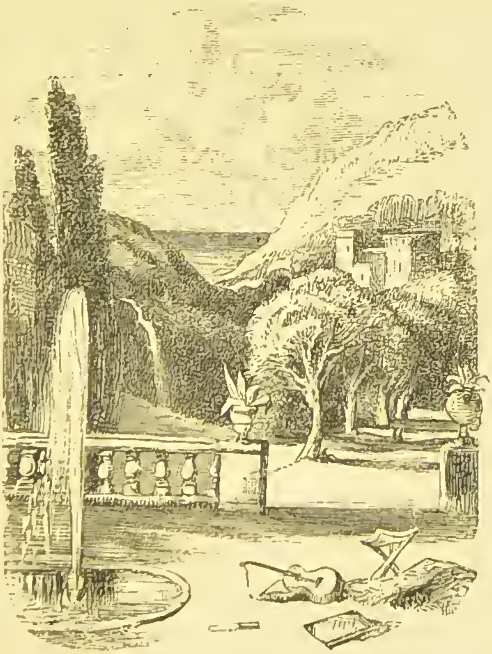
Parsley, Chervil, and Fennel, are commonly designated *pot-herbs*. There are other plants used for seasoning, to which the name *sweet herbs* is popularly given. They all belong to the natural order *Labiatæ*, an order remarkable for aromatic fragrance, due to the presence of volatile oil, abundantly contained in glands which exist in every part. Of a few of these a very brief notice only can be given.

Common Mint, or Spearmint (*Mentha viridis*), is one of the best of the sweet herbs. It belongs to a genus of which several species are common natives of Britain. All the species have a remarkable similarity of odour, which, however, is stronger in some than in others, and in some comparatively coarse, in others delicate. The odour of Peppermint (*M. piperita*) is stronger than that of any other species; but the plant is only used for distillation, to yield an essential oil, which is used as a stomachic stimulant and carminative, and for making peppermint water, which, containing a little of the essential oil, possesses the same properties in some degree. The only species cultivated or used as a sweet herb is Spearmint, a native of marshy places in many parts of Europe, and of which there are several cultivated varieties, differing considerably in flavour, some being much more delicate than others. Oil of spearmint and spearmint water are used medicinally as carminatives; but at present the plant is rather to be noticed for its use in making mint sauce, well known as an agreeable accompaniment to roast lamb, and for the sake of which chiefly it is cultivated in kitchen gardens. It is almost unnecessary to add that the sauce is made by merely chopping the young leaves of the mint into very small pieces, pouring vinegar over them, and adding a little sugar.

Thyme (*Thymus*) is another genus of labiate plants, of which some of the species are much esteemed as sweet herbs. The wild thyme (*T. serpyllum*) is one of the most common plants of dry pastures in Britain, often growing along with heath, and diffusing around it a delicious odour. Garden Thyme (*T. vulgaris*) is a native of the south of Europe, and is very generally cultivated on account of its fragrance; almost no cottage garden being without its plant of thyme, of which women often carry a sprig to church on Sundays. Thyme is much used in England for flavouring green peas, a use which, however, is far from being common in Scotland. A variety called Lemon-scented Thyme is peculiarly esteemed for its fragrance.

Sage (*Salvia officinalis*) is a much larger plant than thyme, and, like it, almost a shrub. It has hoary, crenulate leaves, wrinkled in a peculiar and beautiful manner. The leaves are used for flavouring sauces, for stuffing turkeys, and for other purposes of cookery. Sage is a native of the south of Europe, and has long been cultivated in Britain. To the same genus belongs Clary (*S. sclarea*), a native of the middle parts of the continent of Europe, a herbaceous plant used for seasoning soups and for flavouring wine. Clary wine, made by infusing clary in white wine, was formerly much esteemed in England.

Marjoram (*Origanum*), Basil (*Ocymum*), and Savory (*Satureja*), are genera of each of which more than one species is cultivated, for purposes similar to those for which thyme and sage are used.



CHAPTER XLIV.

PICKLES.

PICKLES are leaves or other parts of plants preserved in vinegar, to be used along with meat. They are generally prepared by pouring boiled vinegar over the raw herb ; but it is sometimes previously subjected to a very partial boiling. Pickles have sometimes been described as one of the most indigestible articles of food ; but the truth rather is, that, when very moderately used, they contribute to the digestibility of the other articles of food along with which they are eaten. They are generally used with beef, mutton, or other animal food ; but are sometimes eaten with bread alone.

Many kinds of plants are used for pickling. The red cabbage, already mentioned, is one of the most common in Britain. The pods of the radish, and the seeds of the Indian cress, have also been noticed. Young cucumbers, called *Gherkins*, are much used, also small onions ; and *Mixed Pickles* are made of these, with a small addition of the pods of *Capsicum*, or chilies, which will be afterwards mentioned in the chapter on Pepper.

The Love-apple, or Tomato (*Solanum lycopersicum*, or *Lycopersicum esculentum*), a plant nearly allied to the potato, a native of the tropical parts of America, is highly valued for pickling. It is now extensively cultivated, not only in its native country, but in the East Indies, and in all the warm parts of the world. The plant is an annual, with interruptedly pinnate, hairy leaves, yellow flowers, and large, many-celled berries, which are sometimes of a yellow colour, and almost globular, sometimes of a dark purple, and very deeply ribbed. The fruit is not only used for a pickle, but for sauces ; and in Italy, where the plant is in general cultivation, almost no dish is presented at table without the accompaniment of tomatoes in some shape, or tomato sauce. In Britain, the tomato must be reared on a hot-bed, except in the very south of England, although it may afterwards be planted out in a warm southern exposure. The pickle of tomatoes is made of the unripe fruit ; the sauces are made of the ripe fruit, which also yields an excellent ketchup. The fruit itself is boiled and prepared for the table. It is seldom relished by those who are unaccustomed to it, but very much by many who are.

The Caper (*Capparis spinosa*) is a shrub with spiny trailing branches, sometimes long enough to be used as walking-sticks. It belongs to the natural order *Capparidaceæ*, allied to *Cruciferæ*, and is a native of the countries on the shores of the Mediterranean. It is often found growing amongst ruins, covering them with its beautiful foliage, and adorning them with its fine flowers, which are white, and are produced on long flower-stalks. It is supposed to be the '*hyssop* which springeth out of the wall,' mentioned in Scripture as one of the subjects of which Solomon spoke. It was introduced into Britain about the end of the sixteenth century; but is too tender to succeed well in the open air, except in the most southern parts of England, and even there, requires a sheltered situation, and a southern exposure. In the early part of summer the caper-bush begins to flower, and continues flowering till the beginning of winter. The flower-buds are the part used. They are gathered when almost ready to expand, and are put into vinegar and salt; are afterwards sorted according to their size and colour, the smallest and greenest being the best, are again put into vinegar, and packed up in bottles for sale. Large quantities of capers are imported into Britain from the south of Europe, and, as is well known, are chiefly used with boiled mutton.

Samphire (*Crithmum maritimum*) might have been noticed among salad plants, being used both as a salad and for pickling. It is, however, chiefly used for the latter purpose. It belongs to the natural order *Umbelliferæ*, and has fleshy leaves, twice or thrice pinnate, with few lanceolate leaflets. Samphire has never been cultivated, or only for curiosity, but grows abundantly on some of the cliffs on the south coast of England, and is gathered that a pickle may be made of its leaves. It has a fine aromatic flavour, and is slightly saline. Samphire is sometimes gathered by men let down from the cliffs by ropes, as the eggs of sea-fowls are collected in the northern islands. Shakespeare's lines have been often quoted, but we must quote them again :

> 'How fearful
> And dizzy 'tis to cast one's eyes so low !
> The crows and choughs that wing the midway air,
> Show scarce so gross as beetles : half-way down
> Hangs one that gathers samphire, dreadful trade !
> Methinks he seems no bigger than his head.'

CHAPTER XLV.

NUTS.

THE fruit of some kinds of trees and other plants, besides the seeds of the corn-plants and of the kinds of pulse already noticed, are important as articles of food, whilst many others are prized as articles of luxury. Nuts are those fruits of which the eatable part, or kernel, is enclosed in a hard shell, without any fleshy covering. The chestnut—of which the outer covering, however, is rather membranaceous than hard, as in the nuts generally—and the cocoa-nut, have already been described, as principal articles of food to the inhabitants of some countries. None of the other nuts are in this respect of equal importance, although some of them are of no little value.

The kernels of nuts generally contain a very considerable quantity of fixed oil, which may be obtained from them by expression; and the oil of those nuts which are themselves eatable, is bland,

and may be used for food as well as for other economical purposes. The oil obtained from some kinds of nuts is extensively employed as an article of food, and enters into the preparation of a great variety of dishes in some countries, these nuts being, indeed, chiefly valuable on this account.

Of the nuts produced and used in Europe, one of the most important is the Walnut (*Juglans regia*). The walnut is believed to be a native of Persia, but has been very long cultivated in the south of Europe. It is of great value as a timber tree, the wood being both beautiful and durable. Walnut wood is much used for gun-stocks and for furniture. The tree grows well even in the northern parts of Britain, and in the southern parts ripens its fruit perfectly. Indeed, the fruit is sometimes ripened even in the north of Scotland. The walnut has been cultivated in England as a fruit tree since the middle of the sixteenth century. It is a noble and beautiful tree, somewhat resembling the oak both in size and general form, but the leaves are pinnated, and somewhat resemble those of the ash ; the leaflets, however, are much larger and broader. The leaves have often a pleasant balsamic smell, which is much more notable in some trees than in others. The male flowers are in catkins, although the tree does not belong to the natural order *Amentaceæ*, but to a small natural order, *Juglandaceæ*, nearly allied to it.

The walnut is extensively cultivated in the south of Europe as a fruit tree, and great quantities of oil are made from its nuts. The oil is much used both in cookery and in lamps, also for imparting a lustre to timber, and by artists to fix delicate colours.

Very similar to the common walnut is another species of the same genus, the Black Walnut (*Juglans nigra*) of North America,—a noble tree, with much larger leaves than the European species. The tree sometimes attains the height of 100 feet. Its timber is superior to that of the European walnut, and is in high reputation for the purposes of the cabinetmaker; but its fruit is inferior. The fruit, however, is much used throughout the United States.

A third species, the Grey Walnut or Butternut (*Juglans cinerea*) of North America, produces a fruit of less value than either of the species already noticed.

Closely allied to the walnuts, and of the same natural order, are the North American trees called Hickory (*Carya*). The nuts of several species are brought to market in the American towns. They resemble walnuts, but are inferior. Those of some of the species have so thick and hard a shell, with such great woody divisions, that the kernel is not worth the trouble which its extraction costs.

The Hazel (*Corylus Avellana*) is the only British tree or shrub producing an eatable nut. It belongs to the natural order *Corylaceæ* or *Cupuliferæ*. It is a native of the middle and south of Europe, and receives its specific name from the town of Avella, near Naples, where it has long been very extensively cultivated. It is a shrub or small tree, with spreading and very crooked branches when old, yet sending up from the root long and beautifully straight shoots, which are employed for making colliers' baskets, and for a variety of purposes. It is very common both in England and Scotland; and in many places, particularly on steep banks, it is allowed to form a copse-wood, either by itself or along with other trees. The male flowers are in pendulous catkins, which present a beautiful appearance in early spring, ere yet there is a leaf on the tree, or on any other deciduous tree. The female flowers are bright red gems, placed at the extremity of buds, all that is visible being mere groups of styles. The nuts grow singly or in clusters, each nut rolled in a leafy lobed unarmed husk, which varies very much in different kinds as to its length and leafiness.

Numerous varieties are cultivated, with larger and finer fruit than the ordinary wild hazel, differing also considerably in the form of the nut, which in some is almost round, in others considerably elongated. These are known as Filberts, Cob Nuts, Lambert's Nuts, etc. The perpetuation of the best varieties is generally secured by grafting, or they are propagated by layers.

Great quantities of the nuts of the wild hazel are gathered for the market, both in Britain and on the continent of Europe. The nuts of the cultivated varieties are also imported into Britain from the south of Europe. The finest are brought from Barcelona, and are known as Barcelona Nuts. In Britain, the cultivation of filberts and cob nuts is chiefly confined to the county of Kent. A rich soil is requisite. The bushes are kept low, somewhat like large gooseberry bushes. M'Culloch, in his *Dictionary of Commerce*, states the quantity of hazel nuts imported into Britain, more than twenty years since, as from 100,000 to 125,000 bushels annually.

An oil is obtained from the hazel nut in the same way as from the walnut, is of very similar quality, and is used for similar purposes.

America produces several species of hazel, very similar to the common hazel, and with nuts of very similar quality. The Constantinople Hazel (*Corylus colurna*), a native of the East, grows to the size of our ordinary timber trees. A fine specimen near London is upwards of 60 feet in height. The bark is white, and the branches spread horizontally. The Constantinople hazel is a very ornamental tree. Its nuts ripen in the south of England in favourable seasons. They are twice the size of the hazel nut, and grow in large racemes.

The Almond (*Amygdalus communis*) is another of the most valuable nuts. It is a native of Barbary, Syria, Affghanistan, and neighbouring countries, but has been very long cultivated in the south of Europe. It is too tender for the climate of Britain, except in the south of England, and even there generally requires to be trained against a wall. The almond belongs to the natural order *Rosaceæ*, and to the sub-order called *Amygdaleæ* or *Drupaceæ*, characterized by the drupaceous fruit, and to which belong the peach and nectarine, the plum, cherry, apricot, etc. It is a tree with lanceolate, serrulate leaves, and solitary flowers, which, however, are produced in great abundance, and are of a white colour. The almond is frequently mentioned in the Bible; and in Eccles. xii. 5, in the poetical description of old age, beautiful allusion is made to the appearance of the almond tree covered with its white flowers, and its resemblance to the hoary locks of an old man.

The fruit, instead of having a fleshy succulent *sarcocarp*, as is usual in the order to which it belongs, has a tough and fibrous one, within which is the nut. Yet it has been doubted if the almond is specifically distinct from the peach and nectarine, the chief distinctive character being in the sarcocarp; and a variety of the almond existing, which, in the covering of its nut, seems to make an approach to the fleshy fruit of the peach.

There are many varieties of the almond in cultivation, but they are divided into *Sweet Almonds* and *Bitter Almonds;* the kernel of sweet almonds being of an agreeable taste like that of other edible nuts, and containing only a bland fixed oil, well known as *Almond Oil*, and used for culinary and for many economical purposes ; whilst the kernel of bitter almonds is very bitter, and contains along with this fixed oil a notable quantity of a very poisonous volatile oil, having hydrocyanic acid for one of its constituents, and well known by the name of *Oil of Bitter Almonds*, used in medicine as a sedative, and in very small quantities in cookery for flavouring. This difference is accompanied with certain botanical peculiarities in the flower and leaf. It is, however, generally supposed that no specific distinction exists, and that the bitter almond best represents the true original species, the sweet almond being the result of cultivation, or an accidental variety perpetuated by cultivation. The same kind of difference is found in the kernels of other kinds of nuts. There are peaches which have sweet kernels, and some of the oak trees of our British woods have acorns almost as sweet and eatable as hazel nuts.

The shell (*endocarp*) of the almond is thin and brittle, but that of some varieties is much more so than that of others. There are several other species of almond, with fruit resembling the common almond.

The Pistachio Nut (*Pistacia vera*) belongs to a natural order (*Anacardiaceæ*) chiefly notable for poisonous juices. Some of the species, however, yield edible fruits, as the Mango of the East, and the Hog Plums of the West Indies. From different species of the genus (*Pistacia*) are obtained the fragrant resinous substance called mastic, and the fine kind of turpentine known as Chian turpentine. The fruit of all the species is a dry drupe. The pistachio tree is a native of Syria, and of the countries eastward, as far, at least, as Bokhara and Cabul ; but it has long been cultivated in the south of Europe. It has deciduous pinnate leaves, with lanceolate leaflets. The kernels are greenish, and are in many parts of Europe generally called *Green Almonds.* They resemble sweet almonds very much in form and flavour. They are also like them in containing a bland oil, but it is much more apt to become rancid ; and the nuts themselves soon become rancid, so that they are very little an article of commerce.

The species of *Pistacia* are not the only resinous trees which yield oily seeds similar in quality to the almond. The seeds of the Stone Pine (*Pinus pinea*) are used in the same way in the south of

Europe, and the seeds of the Cembra Pine (*Pinus cembra*) in Siberia. They may be noticed here, although not to be ranked amongst nuts, however similar their qualities. The seeds of the *Coniferæ* appear to be generally of the same quality, but those of most of them, as of the pines and firs with which we are familiar in this country, are too small to be of any use. They form a principal part of the food of squirrels and birds; and difficult as nurserymen find it to tear in pieces the cones of some species, to get the seeds for the purpose of sowing, the squirrel seems to find the work easy enough, as any one may be satisfied who walks through a fir wood and observes the ground strewn with the remains of cones, from which he has extracted all their nutritious stores. This is not the place for any general account of the *Coniferæ*, the peculiar appearance of which, so different from that of other trees, is well known to every one. Nor would their edible seeds be here mentioned in a chapter on nuts,—as they are not the kernels of nuts, but produced in a very different manner, under the scales of cones (*strobili*),—if it were not for their great similarity in flavour and other properties to the kernels of nuts, and particularly of the almond and pistachio. The Stone Pine (*Pinus pinea*) very much resembles the Scotch fir (*P.*

sylvestris), branching in the same manner, and with the same tendency to form a large umbrella-like head. It is a native of the south of Europe and of the neighbouring parts of Asia, and forms a very characteristic feature in the scenery of the countries bordering on the Mediterranean. It is one of the trees in which painters seem to have specially delighted, and is often introduced in connection with the ruins of Greece and Italy. Its leaves, like those of the Scotch fir, are in pairs. Its cones are of a rounder form, obtuse, about four inches in length and three in diameter ; the

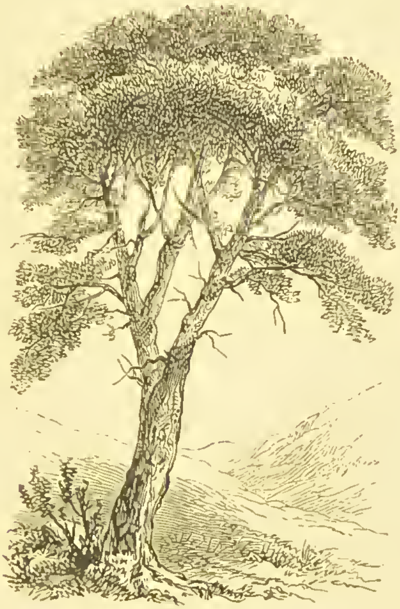


FIG. 19.—STONE PINE.

seeds are large and oblong, as sweet as almonds, and far more easy of digestion. They are used in comfits, and sometimes as a principal article of food ; but, like pistachio nuts, they are apt to become rancid, and are therefore not largely exported from the countries in which they are produced. The London fruiterers, however, import them in the cones, in which way they can be preserved from rancidity ; but of course the great additional bulk adds to the cost of transport. The tree is cultivated in Portugal for the sake of its fruit. Its timber is also valuable. The Cembra Pine, or Siberian Stone Pine (*Pinus cembra*), is a native of Switzerland and of Siberia. Its seeds resemble those of the stone pine in size, quality, and use. In Siberia it is not an uncommon thing to cut down a noble tree in order to get at its cones. *Pinus Lambertiana* and *P. Gerardiana*, natives of the north-western parts of America, have large eatable seeds like those of the stone pine. The large seeds of different species of *Araucaria*, also coniferous trees, furnish food to the inhabitants of the countries in the southern hemisphere, of which they are natives. One species of araucaria (*A. imbricata*), the only species hardy enough to endure the climate of Britain, is now familiar to most persons as one of the most remarkable trees recently introduced into this country, and it seems not unlikely to give a new and very distinct feature to the landscape in many places, as the spruce fir and the larch, both foreign trees, have already done to a degree which it is not easy to estimate. It may be doubted if the fruit can be ripened except in the very south of England. *Araucaria imbricata* is a native of the Andes of Chili; a noble and stately tree, its seeds yielding the principal part of their food to the Indians of its native regions. Its cones are of great size; and although the name cone, derived from the common pines, is applied to them, on account of their structure and botanical relations, they are of a globular form. The number of seeds contained in a cone is very great, and each seed is as large as an almond.

To the same natural order with the pistachio nut (*Anacardiaceæ*) belongs the Cashew Nut (*Anacardium occidentale*). The tree which produces it is large, with oval leaves, a native of many tropical regions, both in the eastern and western hemispheres. The fruit in this genus is a kidney-shaped nut, seated on the end of a pear-shaped fleshy fruit-stalk, which in the cashew nut is acid and eatable, and much larger than the nut itself. The outer covering of the nut possesses in a high degree the acrid and poisonous properties common in the order. The seed, when roasted, is eatable and wholesome, and is much used in the West Indies and in other countries; but caution is requisite in the roasting, as injury is apt to be sustained from the acrid vapour. The kernel is oily. Cashew nuts are imported into Britain.

Brazil Nuts, common in our shops, are obtained from *Bertholletia excelsa*, a great and lofty tree, a native of the warmest parts of South America. It belongs to the natural order *Lecythidaceæ*, allied to myrtles, etc. Many species of this order, all great South American trees, have for their fruit a huge woody capsule, which, in some of them, opens with a lid. The woody capsules of *Lecythis ollaria*, a native of Brazil, are known by the name of Monkey-pots, and are used as drinking vessels, as are those also of others of the genus. The fruit of *Bertholletia excelsa* is often larger than a man's head, and within the woody capsule are the nuts, packed closely together, each almost an inch and a half long, and of a somewhat triangular form, with a hard shell and an oily kernel. The seeds of some species of *Lecythis* are also eatable. Those of *Lecythis ollaria* are the Sapucaia Nut, now sometimes to be seen in our shops, but not so much esteemed as the Brazil nut, and much less extensively imported.

CHAPTER XLVI.

SUCCULENT FRUITS.—THE POMACEÆ.

THE term *fruit* is employed by botanists to designate the mature ovule with the seed or seeds which it contains, or the product of many flowers combined in ripening, and includes even the floral envelopes and the bracts, which in many cases remain. In this sense, it is applicable to every phanerogamous plant; and in a corresponding sense it is used also as to cryptogamous plants. But the popular use of the word is different, and the various kinds of grain, or pulse, are not spoken of as fruits, nor dry seed-vessels, as those of the poppy and mignonette. The term is commonly used only when some part of the fruit—botanically so called—is succulent, as in the apple, cherry, grape, etc. Almost all countries inhabited by man produce some kinds of fruit, wholesome and grateful to the palate ; but they are most abundant and of greatest variety in warm climates. The Laplander and Esquimaux gather, during their short summer, the berries only of a few species of *Vaccinium*, *Rubus*, etc., from the arctic wastes; whilst the inhabitants of tropical countries have, at all times of the year, trees loaded with delicious fruits. The goodness of God appears in this adaptation of the productions of nature to the wants of man; for the moderate use of fruit is favourable to health, and is particularly necessary in warm climates, although even the inhabitant of the arctic regions is probably much indebted to this corrective of the tendencies of the diet to which he is confined during the greater part of the year.

Some of the fruits both of temperate and tropical countries, but particularly of the former, have been long and much cultivated. Man has carried them with him to his new settlements, as well as the corn-plants and others on which he chiefly depends for subsistence. Merchants and travellers have conveyed them from one country to another; and even conquerors have brought them home, as highly-prized treasures from the scenes of their victories, to their native land, from which they have been again carried forth to become a boon to other subject provinces. Some of the best fruits cultivated in Britain were thus introduced by the Romans.

Edible fruits may be regarded as generally belonging to three classes, of very different structure, *pomes*, *drupes* or *stone-fruits*, and *berries*. To the first of these belong the apple, pear, etc., of the natural order *Rosaceæ*, sub-order *Pomeæ*, the order *Pomaceæ* of Lindley. *Pome* (from the Latin *pomum*, an apple) is a botanical term, applied to fruits which have the seeds enclosed in cartilaginous or bony cells in the centre of a fleshy substance. The most valuable of the pomaceous fruits, and one of the best of all fruits, is the apple (*Pyrus malus*). It has been supposed that the Romans obtained the apple, as well as some other of the fruits now most common in Europe, from Armenia. It is, indeed, not improbable that the cultivation of the apple may have originated in the East, and thence extended to Europe, and that the first improved varieties of the fruit were of eastern origin; but it cannot be doubted that the parent of all the cultivated apples is the *crab*, a common native of the middle parts of Europe and of Britain. The fruit in a wild state is comparatively small, and very austere; in cultivation it attains a larger size, and acquires a delicate flavour, pleasantly combining sweetness with acidity. The varieties of the apple are extremely numerous, amounting to many hundreds, and differ much in size, form, flavour, and colour. The apple has the valuable quality—more, perhaps, than any other fruit—of retaining its freshness and fine flavour long after it is gathered, so that it can easily be exported from one part of the world to another, and has, in fact, become a considerable article of commerce. Some of the kinds can, with due care, be kept for many months.

The cultivation of the apple extends as far north as Petersburgh, and the southern parts of Scandinavia. It was probably first cultivated in Britain by the Romans. Many of the finest varieties have been introduced into Britain from the Continent in modern times; but some appear to be of British origin, and fine new varieties have been produced since the beginning of the present century by British horticulturists.

The apple succeeds well on many very different soils, but dislikes an excess of moisture. It is generally grafted on a crab stock, although some kinds are occasionally raised from seed. By grafting on stocks of a dwarf variety called the Paradise Apple, or Paradise Pippin, many kinds are dwarfed, whilst they are also brought into a fruit-bearing state much earlier than would otherwise be the case. The finest kinds of apple are cultivated in Britain as wall trees. Many kinds are also cultivated as espaliers, and to the farthest north of Scotland some kinds are common as standard trees. Apples are extensively cultivated in France and Germany; and from France they are exported in large quantities to Britain. In North America—both in the United

States and the British possessions—apples are produced in great abundance. The American apples are remarkable for their large size and excellent quality. They form a considerable article of export.

Apples are used for the dessert, for baking, and in various other ways. Dried and compressed in a peculiar manner, they are called *biffins,* and in this state may be long kept fit for use, particularly for baking. Apples may be made into an excellent preserve; and apple jelly is a well-known delicacy.

The expressed juice of apples becomes by fermentation an effervescing vinous liquor called *Cider.* For the making of cider, particular kinds of apple are cultivated to a great extent in some of the south-western counties of England—particularly those of Hereford, Worcester, Somerset, and Devon. Apple orchards of forty or fifty acres are there not uncommon, and add much to the beauty of the scenery. The trees are planted at considerable distances from each other, and grain and other crops are cultivated among them. In the harvest season, immense heaps of apples may be seen near the cider presses. The extensive plantation of orchards for the making of cider is supposed to have no older date than the beginning of the seventeenth century, and during the long wars with France was much encouraged, as tending to render

England independent of the wines of that country. Cider is made to a considerable extent in North America.

The Siberian Crab (*Pyrus prunifolia*), and the Small-fruited Crab (*P. baccata*), often also called the Siberian Crab, are species of the same genus with the apple, and so nearly allied to it that many botanists refuse to regard them as distinct. They are both natives of Siberia, and have been introduced into the gardens of Britain. The fruit is scarcely larger than a cherry, and pretty much of the same form. The trees are very productive, and the fruit makes an excellent preserve with syrup. The *quass* or cider of Siberia is made of these kinds of fruit.

The Pear (*Pyrus communis*) is another species of the same genus with the apple. It is, like the apple, a native of the middle parts of Europe and of Asia, but is a somewhat doubtful native of Britain. It is a taller tree than the apple, of harder wood, and of longer duration. It has been cultivated as a fruit-tree from a very early period; its cultivation is mentioned by Homer. It succeeds in the same climates with the apple, and accommodates itself to a great variety of soils; but the fruit of many kinds must be eaten almost as soon as it is taken from the tree, and it is with difficulty that any kind can be kept for more than a few months. It is used for the same purposes as the apple, although less frequently for baking. A vinous effervescing liquor called *Perry* is made from the fermented juice. Perry is much less extensively used than cider, but large quantities of it are made in some of the middle parts of England, particularly in Worcestershire. The varieties of pear cultivated for the making of perry are remarkable for their austerity. The whole number of varieties in cultivation is perhaps smaller than those of the apple, but is still very great; and besides differences in the foliage and habit of the trees, they differ very much in the size, form, and quality of the fruit. In some varieties the specific characteristic of tapering towards the base—from which the term *pear-shaped* has come into use as a common designation of form for other objects—is almost lost; but in general it is preserved amidst all the other diversities. The *Jargonelle* has long been one of the most popular of the varieties generally cultivated in Britain, but is perhaps excelled by some of the French and Flemish varieties recently introduced. The finer varieties of pear, and particularly those which do not ripen very early, require in the northern parts of Britain favourable situations, and all the advantage of a wall with a good aspect. The pear is commonly grafted on stocks of its own species, but sometimes on quince stocks, by which it is dwarfed, and sometimes on tall stocks of the mountain ash or rowan tree, on which it succeeds very well.

There are several species of *Pyrus* very similar to the common pear, if indeed they are not mere varieties of it, as the *Pyrus pollveria*, a native of Germany, with beautiful flowers and not unpleasant fruit, and *P. salicifolia*, a small tree with pendulous branches and beautiful silvery leaves, which grows on the Caucasian mountains and in Persia.

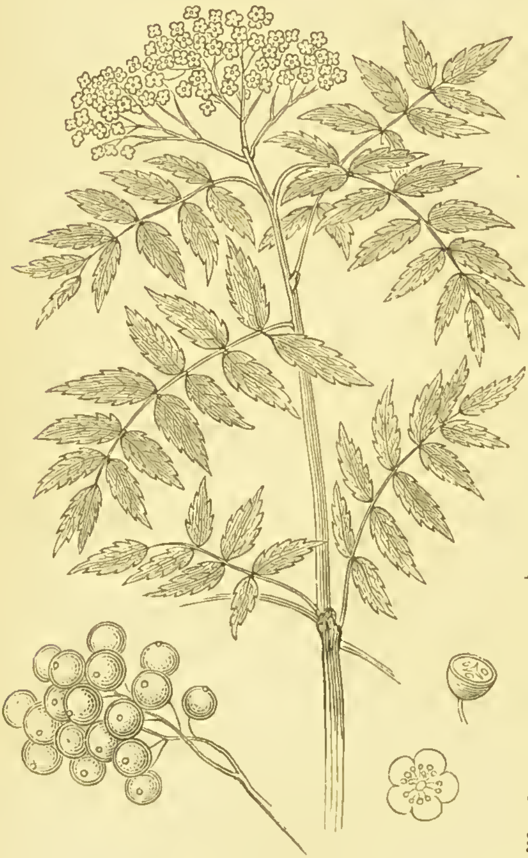


FIG. 20.—ROWAN TREE.

The Mountain Ash or Rowan Tree (*Pyrus aucuperia*) can hardly be reckoned among fruit-trees, although children eat its acid and somewhat astringent fruit, and a jelly is occasionally made of it. The tree is a common native of Britain and of most parts of Europe, is connected with many ancient superstitions, and is often planted as an ornamental tree. It does not attain a great size ; but its upright form, pinnate leaves, and large corymbs of small red berry-like fruit, are very pleasing to the eye.

The Service Tree (*Pyrus domestica*) is a very doubtful native of Britain, but is found in some of the middle parts of Europe. It is a large tree, in habit and foliage resembling the mountain ash, and is sometimes cultivated as a fruit-tree. The fruit is produced in panicles, and is almost of the size of a small pear, which it also resembles in shape. It requires to be kept till it becomes soft from incipient decay, and then has an agreeable acid flavour.

The Wild Service or Sorb Tree (*Pyrus terminalis*) is a native of some parts of Britain. Its leaves are ovate, or heart-shaped, and lobed. The fruit resembles the true service in quality, but is produced in corymbs, and is small. It is brought in large quantities to the London market from Hertfordshire, where the tree is abundant. The small red fruit of the White Beam Tree (*Pyrus aria*) is also of similar quality. The tree is not uncommon in the Highlands of Scotland, and in other mountainous parts of the British Islands, and is frequently planted as an ornamental tree, the white down on the under side of the leaves giving it a peculiar appearance, which contrasts well with the green foliage of other trees.

The Quince (*Cydonia vulgaris*) is another fruit-tree nearly allied to the apple and pear. It is said by Pliny to have been introduced into the south of Europe from Crete; but this may probably relate to the improved and cultivated variety, as the tree seems to be a native of all the countries surrounding the Mediterranean Sea. It is a tree of low growth, much branched, and generally distorted. The leaves are of a rounder form than those of the apple or pear, the flowers are small and of no beauty, but the fruit is large, and of a rich yellow colour, and is supposed to have given rise to the ancient fable of the Apples of the Hesperides. The fruit has a peculiar smell, and a rather austere taste, but is much valued for baking, and for making a sweetmeat called Quince Marmalade. The word *marmalade* is indeed said to be derived from *marmelos,* the Portuguese name for the quince. A pleasant vinous liquor, resembling cider and perry, is made from the fermented juice. The quince is not largely cultivated in Britain, in the northern parts of which it is little known, except as a stock for grafting pears. The Chinese Quince (*Cydonia Sinensis*) is sometimes planted in shrubberies, but its fruit is very inferior to that of the common quince. The Japanese Quince (*C. Japonica*) is often trained on walls in Britain, on account of the great beauty of its deep red flowers, which it produces in great abundance in the latter part of spring, and often throughout the whole summer. The fruit, which is sometimes plentifully produced, makes a good marmalade.

The Medlar (*Mespilus Germanica*) is another species of the same natural order, and nearly allied to those already mentioned. It is a native of the south of Europe, naturalized in some parts of England. In a wild state it is a spiny tree of small size. The cultivated varieties are larger trees, destitute of spines, and with larger fruit, in size and shape similar to the apple, but requiring to be left on the tree, or to be kept after being gathered, until it has become quite soft or *bletted,* when it is very pleasant. The medlar is frequently cultivated in England, but very rarely in Scotland.

Of the genus *Cratægus,* or Thorn, well known to every one by the familiar example of the Hawthorn (*C. oxyacantha*), there are many species, which have been introduced into Britain as ornamental trees, and a few of which are worthy of notice on account of their fruit. In their habit and foliage they all have a strong general resemblance to the common hawthorn. The Azarole (*C. azarolus*), a native of the Levant, has an agreeably acid fruit, about the size of the Siberian crab, which frequently appears at the dessert in Italy and the south of France. It is not very freely produced in Britain, although the tree or shrub is sometimes cultivated.

The Amelanchier (*Amelanchier ovalis*) is a tree of the same group. It is a native of North America. Its fruit is only about the size of a pea, but is produced in abundance, and is used both in a fresh and dried state, and excellent puddings are made of it.

The Loquat (*Eriobotrya Japonica*) is a Japanese fruit, now cultivated to some extent in Australia. The fruit is yellow, downy, and about the size of a large gooseberry, with a taste resembling that of the apple.

CHAPTER XLVII.

SUCCULENT FRUITS—DRUPACEÆ OR STONE-FRUITS.

WE have seen that some of the most esteemed fruits of temperate climates are produced by trees of the natural order *Rosaceæ*, of the section *Pomeæ*, the order *Pomaceæ* of Lindley. Closely allied to this is another section of *Rosaceæ*, known from the days of Jussieu as *Amygdaleæ* (from *Amygdalus*, an almond), which has been raised by Lindley to the rank of a separate order, *Drupaceæ*. The name *Drupaceæ* is derived from the fruit, which is what botanists call a *drupe*, and which, in popular language, is called a *stone-fruit*. To this order or sub-order several of the best fruits of temperate countries belong. Any one who examines with a little care the flower of the peach, plum, cherry, or almond, will perceive its resemblance in structure to that of the apple or pear, or of the rose, the strawberry, the raspberry, or the bramble. The fruit, however, is very different from that of any of these, and is a drupe with stone and kernel, a kind of nut, wrapped up in a cellular and juicy, often very palatable covering. In the almond, indeed, the covering is reduced to a mere husk, which shrivels instead of enlarging as the fruit ripens. It has already been mentioned among nuts, with which it is popularly ranked.

It is worthy of notice, that although many fruits of this order or sub-order are wholesome and pleasant, yet the trees and shrubs on which they grow — for none of the species are herbaceous plants — all produce more or less plentifully that deadly poison, hydrocyanic or prussic acid. In the pulp or *sarcocarp* of the fruit, it is not often present, or only in very small quantity; but in that division of the genus *Cerasus* (cherry), of which the Common Laurel or Cherry Laurel (*Cerasus laurocerasus*) is the type, the fruit is very poisonous, owing to an oil in which this acid abounds, and which is also present in the leaves and bark, imparting to them similar properties. In the leaves and bark these properties are found in some degree throughout the whole of the *Drupaceæ*, and also very often in the kernel of the fruit. *Cerasus capricida*, a native of Nepaul, is so poisonous that goats die which browse on it. It is very interesting to observe, in this as in many other instances, the different qualities of different parts of plants, and how the organs of one part and another are adapted to different purposes of that marvellous chemistry of nature, the secrets of which human science has only begun to explore.

The Peach and Nectarine are varieties of the same species (*Amygdalus Persica*). The tree has oblongo-lanceolate leaves, very similar to those of the almond; flowers also very similar, often produced in great profusion, and appearing before the leaves in spring. The delicate colour of the flowers—a kind of pink—is well known; and it is common to speak of a *peach-blossom colour*. The tree is believed to be a native of the north of India and of Persia. It has been cultivated from very ancient times. The peach is said to have been introduced into England about the middle of the sixteenth century, and the nectarine somewhat more recently. Both the peach and the nectarine are much cultivated in all the warmer temperate parts of the globe, particularly in those which are not quite warm enough for the orange. They extend into climates a little colder than those in which the vine succeeds well. Even in Scotland, the peach produces fine fruit in the open air, upon walls which have a good exposure, only requiring a little protection for the flowers in spring. In France, both the peach and the nectarine are much cultivated as wall trees, but succeed also well as espaliers. In the United States of America, the peach is much cultivated as a standard, and often in orchards of large extent ; but as the trees are generally raised from seed, without budding or other care to secure fine varieties, the greater part of the fruit is of very inferior quality, and is chiefly used for making *Peach Brandy*, swine being fed with the refuse.

The peach and nectarine are distinguished from each other by the downy skin of the fruit in the former, and its perfect smoothness in the latter. The nectarine is rather more tender than the peach, and cannot be cultivated in regions so northern, but is regarded as rather the finer fruit of the two. There are many varieties, and those both of the peach and nectarine are divided into two classes, called *Freestones* and *Clingstones*, the pulp of the former separating readily both from the skin and from the stone, that of the latter adhering rather tenaciously to both.

A very remarkable variety of the peach was introduced from China more than forty years ago, and is known as the *Flat Peach of China.* It has long been cultivated, and is much esteemed in China. It may be regarded as a monstrous variety, perpetuated by horticultural art. It is so compressed that its length is only about one-third of its transverse diameter; the stone, which is shorter than that of the ordinary varieties, occupying its whole length, and the fleshy part thickening all around, so as to leave a hollow at the crown.

In Britain the peach and nectarine are usually budded on plum stocks. In warmer climates peach or almond stocks are used. No fruits, except the grape, are more extensively forced in Britain than the peach and nectarine. Besides houses appropriated to this use, flued walls are also very generally employed.

The Apricot (*Prunus Armeniaca*), notwithstanding the resemblance of the fruit to the peach, is not of the same genus, but belongs to that which produces the plum and sloe. It is a native of the north of India, probably also of the Levant, and is said to abound on the slopes of Mount Ararat and in other parts of Armenia. The apricot is much cultivated in Asia, from the shores of the Mediterranean to China and Japan, and flourishes abundantly in the African oases, from which its dried fruit is carried as an article of commerce to Egypt. Its cultivation extended into Europe in ancient times, although the Romans do not seem to have highly valued it. It is said to have been introduced into England by the gardener of Henry VIII. In the northern parts of Britain, the apricot is often partially forced by means of flued walls; but some of the varieties produce good fruit in Scotland, as wall trees, without the aid of artificial heat. Besides being used as a dessert fruit, the apricot, both in a ripe and unripe state, is much employed for making tarts and puddings. An excellent preserve is also made of it; and in China lozenges are made of the clarified juice, which, when dissolved in water, make a very agreeable beverage.

The Plum (*Prunus domestica*) is another of the fruits most extensively cultivated in temperate countries. Its cultivation extends into colder regions than that of the peach, or even the apricot; although, in the variable climate of Britain, its blossom, when induced to expand by mild spring weather, is apt to suffer from subsequent frosts. The plum is regarded as a native of the middle parts of Europe and Asia, and is commonly included in the British flora; but, on the one hand, it is doubted if the wild plum of England is anything else than the cultivated tree escaped from cultivation and degenerated; whilst, on the other hand, some of the most eminent botanists regard the plum as of the same species with the Bullace (*Prunus insititia*) and the Sloe (*P. spinosa*), uniting them all under the name of *Prunus com-*

munis. The differences between them are indeed such as botanists have found it very difficult to define, unlike as the extreme forms are, and they are linked together by many intermediate forms. The *Damson* may be regarded as a form intermediate between the largest plums and the gnarled sloe. But what is owing to original difference, what to cultivation, what to mere circumstances of soil and climate, it is impossible to determine.

The first cultivated plums are said to have been introduced into England from France or Italy, in the fifteenth century. The well-known and highly esteemed variety called the *Green Gage* was introduced into France by the queen of Francis I., and from her has received its French name of *Reine Claude.* It was introduced into England by a gentleman of the family of Gage, from whom it derives its English name. The number of varieties of plum in cultivation is very great, and is continually increasing, but none superior to the Green Gage is yet known.

The finest kinds of plum are cultivated in Britain as wall trees, but are also not unfrequently, even in Scotland, treated as espaliers or as standards. Many kinds are common standard trees in all parts of the island.

There is perhaps no fruit in cultivation of which the varieties differ more in form, size, and quality.

The difference in size between the magnum-bonum plum and the damson is not more considerable than the difference of quality in some of the kinds.

The uses of the plum for the dessert and for preserving are well known. *Prunes* are dried plums, which, along with *French plums,* scarcely different, form a considerable article of commerce.

The Cherry is another of the fruits which have been long and extensively cultivated. It is a native of the temperate parts of Europe and Asia, extending into the colder parts of the temperate zone. The cultivated varieties are commonly supposed to have originated from two wild species,—*Cerasus avium* and *C. vulgaris,* or *Prunus avium* and *P. cerasus,* for some botanists still prefer to reckon *Cerasus* as a mere sub-genus of *Prunus.* They are very similar, and both are pretty frequent in Britain,—the wild cherries or *geans* of our woods. *C. avium* is found even in the Highlands of Scotland, and perhaps it alone is truly a native of Britain, and the other may have escaped from cultivation; but in regard to a plant which seems so well adapted to the climate, is so apt to be disseminated by birds, and has so long been frequent in gardens, certainty on such a point is unattainable. *C. avium* is supposed to be the original of most kinds of cultivated cherries; *C. vulgaris* of those which are known as *Morellos*, which have more elongated and twiggy branches, and present other characters of difference in their leaves, and particularly in their manner of growth, by sending out underground shoots.

The cultivation of the cherry, as of many other fruits, seems to have begun in the East. Lucullus is said to have brought it from Armenia to Rome, about B.C. 68; and Pliny mentions that in less than one hundred and twenty years it had extended to Britain. The common statement, that it was introduced into England in the reign of Henry VIII., is certainly incorrect, for there is evidence that cherries were sold in the streets of London in the fifteenth century.

The cherry is cultivated in Britain as a standard, an espalier, and a wall tree. Both the wild and the cultivated varieties are objects of great beauty when covered with their white blossoms in spring, and almost equally so when loaded with ripe fruit.

There are many varieties of the cherry. Some of the smaller kinds are used more for preserving than for the dessert; others chiefly for making *Cherry Brandy*, the *Kirschwasser* of the Germans, an agreeable spirituous liquor. *Maraschino* is an

Italian liqueur, made at Zara, in Dalmatia, from a small black gean or cherry, which is fermented with honey, afterwards with the leaves and the kernels of the fruit, and then distilled and sweetened with sugar.

CHAPTER XLVIII.

SUCCULENT FRUITS.—THE GRAPE.

THE vine (*Vitis vinifera*) is supposed to be a native of the Caspian Sea and neighbouring parts of Asia ; but where it is actually found wild, and where it has become naturalized in consequence of its extensive cultivation, cannot certainly be determined. Lindley seems to regard the *Vitis Indica* of the north of India as really of the same species with the common vine. The vine is a climbing shrub of the natural order *Vitaceæ*, with very long branches and beautiful foliage, which it is unnecessary to describe. It has been cultivated from the most remote antiquity, and was probably employed for the making of wine in antediluvian ages ; for we read in the book of Genesis that immediately after the deluge, Noah planted a vineyard, and that 'he drank of the wine, and was drunken.' The vine must be reckoned one of the most valuable of those plants which God has given for the use of man. Not only is it highly valuable as yielding wine,—which, however men may abuse it to vile purposes of sensuality and debauchery, is nevertheless, in God's own word and ordinances, the chosen emblem of the choicest blessings of the kingdom of heaven,—but it is also of great importance as yielding food to the inhabitants of those countries in which it grows in greatest abundance. Grapes, fresh or dried, are known in Britain chiefly as an article of luxury; and great as is the quantity of dried grapes—*Raisins* and *Currants*—imported into this country, we hardly think of them as a substantive article of food; but to the mountain tribes of Lebanon, and to the inhabitants of Syria and neighbouring countries, they are one of the chief articles of food.

The vine is also eminently a pleasant plant. Few plants are, indeed, of more unpromising appearance in winter, when the long naked branches, with their ragged epidermis, have nothing to gratify the eye; but when the warmth of spring returns, it is soon clothed in verdure and beauty, its extraordinary abundance of sap causing a rapidity of growth seldom equalled, except in plants of tropical climates. Its long shoots, its large lobed leaves, its tendrils, and its rich hanging clusters of fruit, have made it the delight of painters and sculptors,

—no plant of all that the earth produces is so often introduced in ornamental art.

The cultivation of the vine in the open air extends from about the twenty-first to the fiftieth degree of north latitude, and now prevails also to a considerable extent in those parts of the southern hemisphere which have a similar climate. In the United States of America, this branch of husbandry has been comparatively neglected, although the climate is suitable; but of late years the number of vineyards has much increased, particularly in the States west of the Ohio, and some excellent wines are produced, of which Catawba, an effervescent wine, is most worthy of notice. The vine succeeds best in the middle parts of the zone within which it is cultivated. The grapes of the north of Germany and the south of England are inferior to those of the shores of the Mediterranean, and the wine made from them is also inferior. But in the south of Spain, in Sicily, Greece, and other countries on the Mediterranean, the best wines are produced not on districts near the level of the sea, but in those which are more elevated. The best raisins, however, are the produce of warmer districts than those which produce the best wines, the grapes being of finer flavour, although the heat of the climate is unfavourable to the proper conduct of the vinous fermentation, as summer is less favourable than October to the brewing of ale.

In the days of Jewish prosperity, the hills of Palestine appear to have been in great part covered with vines, planted upon terraces, a mode of cultivation to which the habit of the plant particularly adapts it. The terraces remain in many places, although the vines cover them no longer. The mode in which the vine is cultivated differs much in different countries. In Greece and Italy, it is allowed to grow luxuriantly, trained upon trees, or supported by rows of props. In countries of still warmer climate, it is often trained on trellises, that the owner may enjoy the shade. In the south of England it beautifies the walls of cottages, its cultivation, however, being carried on only to a very limited extent. In France, Switzerland, and Germany, it is usually trained on poles of three or four feet in height, so that the vineyards have a very formal appearance. In Spain, the aspect of the vineyards is almost equally formal, although different, the plants being kept down by pruning, so that they grow without support, contrary to their natural habit, and almost like gooseberry bushes. The same mode of cultivation is employed in the south of France for the vines from which the Frontignac wine is made, which are very small bushes, growing in the sandy soil on the coast of the Mediterranean, and at Constantia, near the Cape of Good Hope, where the famous Constantia wine is produced. The farmers of Cape Colony, however, in general allow their vines to grow without pruning or training, their shoots unpropped and trailing on the ground, to which, and the consequent rotting of some of the grapes, the general inferiority of Cape wine is to be ascribed. A greater attention to the cultivation of the vine has begun to produce a very marked improvement in the wines of South Africa.

The cultivation of the vine is supposed to have extended from Asia into Greece, and thence into Sicily, Italy, and other parts of Europe. The Phœnicians carried it to the south of France, the Romans to the banks of the Rhine. Its cultivation, with that of many fruit-trees, was much extended in Europe by the wise legislation of Charlemagne. The vine appears to have been introduced into England by the Romans, and was certainly cultivated to a considerable extent in the south of England before the Anglo-Saxon invasion. In the thirteenth and fourteenth centuries, vineyards were attached to the principal castles and religious houses in the south of England; and a considerable quantity of wine was made, although much was also imported from the Continent. The old vineyards, however, ceased to be kept up—perhaps because the wine was found to be inferior to that imported—and very few new ones were planted, although we are told of one planted at Arundel Castle in Sussex in the beginning of last century, from which wine was made in large quantity. The vine sometimes attains a great size in the open air in England. A vine at Northallerton extended its branches over several houses, and in 1785 covered 137 square yards. Its main stem was fifteen inches in diameter. Another at Valentines, in Essex, extended its branches 200 feet, and sometimes has yielded four hundredweight of grapes in a season. The famous vine at Hampton Court Palace, which, however, enjoys the protection of glass, seldom yields fewer than two thousand clusters of grapes, averaging a pound in weight. Both of these last mentioned are of the kind called the Black Hamburgh Grape, one of the best suited for a northern climate.

The forcing of grapes, now so largely and successfully prosecuted in Britain, seems not to have been thought of till the beginning of last century. The grapes now produced in vineries in Britain are finer than any to be seen on the continent of Europe, except on the shores of the Mediterranean; and the season of ripening is prolonged by regulating the heat of the hothouses.

The vine does not succeed in the open air to the north of York, although, in peculiarly fine summers, ripe grapes have been gathered in Scotland. Unripe grapes, however, are good for making puddings and jelly. The thinnings of grapes, often thrown away by gardeners, are excellent for these uses.

The varieties of the vine are extremely numerous. They differ in the size of their grapes and of their clusters, and in the form and colour of the grapes, some being round, some oval, some red, and others white.

Vines are propagated by cuttings, and sometimes by seed, but this chiefly when new varieties are sought. Some of the varieties are frequently propagated by grafting—the Syrian vine, a variety of very robust growth, being generally employed for stocks.

Raisins are grapes dried in the sun. The finest raisins known in commerce are brought from Spain, from the neighbourhood of Malaga. The hills of that district are covered with vines, the produce of which is all made into raisins. The bunches of grapes are gathered as they ripen, and are spread on the ground. They are in general sufficiently dry in about fifteen days. Spoiled ones are picked out. If they get rain while thus exposed, they are injured by it. The *Currants* of our shops are the fruit of a variety of the vine producing very small grapes, which abounds in the Ionian Islands, and derives its name from Corinth. They are dried in the sun upon the ground, and then packed into barrels.

Several species of vine are natives of North America. Some of them are so nearly allied to the grape vine of the Old World, that they may be regarded as possibly mere varieties of the same species. The best of them is the Fox Grape, or Wild Vine of North America (*Vitis labrusca*). It has heart-shaped leaves, scarcely lobed, and much larger than those of the common vine. The grapes are large and black, with a rough acid flavour, which is much improved by cultivation; and the fine wines of Ohio are made from the fruit of this species. The other American species are of little value. The Chicken Grape (*V. cordifolia*) derives its name from the very small size of its fruit.

CHAPTER XLIX.

SUCCULENT FRUITS—BERRIES.

THE grape is generally ranked among berries, although the structure of the fruit is somewhat different from that of those strictly so called by botanists, the general character, however, being very similar. Berries have the fruit surrounded by a fleshy skin, and the seeds in the midst of a soft pulp. Many fruits of this kind are produced in temperate and cold countries. Among the most notable of these are the fruits belonging to the natural order *Grossulariaceæ*, an order consisting entirely of small shrubs, many of them spiny. Several species of the *Grossulariaceæ* are found in Europe; two or three are perhaps natives of Britain. Siberia produces a number of species, and they abound in the mountainous parts of India, and still more in North America. The fruit of most of them is somewhat similar to that either of the gooseberry or of the currant, the best known species of the order, and is probably equally capable of being improved by cultivation; but the fruit of some is extremely acid; that of others, as of the Flowering Currant (*Ribes sanguineum*), a very common ornament of our shrubberies in spring, is insipid and mawkish. The common notion, however, that the fruit of the Flowering Currant is poisonous, is completely erroneous. No species of the order *Grossulariaceæ* has a poisonous fruit, although the peculiar flavour of the black currant perhaps indicates properties which, if they were to exist in a much greater degree, might render a fruit rather medicinal than palatable.

The gooseberry, although now pretty frequent in thickets and hedges, is a very doubtful native of Britain. It is found truly wild in the woods of the continent of Europe and of Siberia. Linnæus distinguished two species, *Ribes grossularia* and *R. uva crispa*, the chief difference being the rough fruit of the one, and the smooth fruit of the other; but botanists seem now to be generally agreed in regarding them as mere varieties of one species, *R. grossularia*. If they are distinct species, the cultivated gooseberries are certainly derived from both; but the natural distinction is very small.

It is in colder temperate parts of Europe, and in Britain, that the fruit of the gooseberry attains its finest quality. In the south of Europe it is very inferior; but its cultivation is there neglected; and although now so much cultivated and esteemed in Britain, it has not been so long in cultivation as most of our other common fruits. A chief seat of gooseberry cultivation in Britain is in Lancashire and the neighbouring manufacturing districts, where competition in the production of fine gooseberries has long engaged the attention and employed the leisure hours of many operatives, and where such prizes as a pair of sugar-tongs, a cream-jug, or a corner cupboard have often rewarded the successful competitors at the gooseberry shows. New varieties are very frequently produced in these districts, being very easily obtained from seed; but the care of the Lancashire cultivators has been too exclusively devoted to the production of berries of great size and beauty, and many of the kinds which excel in these respects are very inferior in sweetness and flavour to some of the middle-sized varieties. No better gooseberries are produced in any part of the world than in Scotland.

The gooseberry requires no description, nor can any notice here be taken of the varieties, some of which have fruit not much larger than a large black currant, whilst others are as large as a green-gage plum. Gooseberries are generally propagated by cuttings, which are planted early in spring, and grow with great readiness. The bush is generally kept low by pruning; but this practice has been carried to excess by many cultivators, following the example of those who have aimed at increasing the size without regarding the quantity of the fruit, and in disregard of the nature of the plant, which bears fruit chiefly on the shoots of the former year. It is not uncommon to see gooseberry bushes closely cut back, to the great diminution of the crop. It is necessary to their abundant fruitfulness so to manage the pruning as to have always a supply of young wood, and, at the same time, to prevent the choking up of the centre of the bush by young shoots.

The visits to the garden when the fruit of the gooseberry is ripe, the tarts or puddings made of it whilst still unripe, and the *jam* to be enjoyed at all seasons, are closely connected with all the pleasant associations of childhood and youth in all parts of Britain. The making of jelly from unripe gooseberries is also largely practised; and large quantities of *Gooseberry Wine* are made, too often to be passed off as champagne, which it resembles in its effervescent character, and for which, if it were honestly presented under its own name, it is not a bad substitute.

The Red Currant (*Ribes rubrum*) is a native of the woods of some parts of Europe, chiefly of mountainous districts. It is a doubtful native of

Britain. The White Currant is a mere variety of the Red, probably altogether the result of cultivation. The white and pale varieties are generally larger than the red, and may be regarded as more improved by cultivation. Both red and white currants are very extensively cultivated in Britain, as well as in some parts of the continent of Europe, and in North America; yet the varieties are not nearly so numerous as those of the gooseberry, nor has the same attention been bestowed on them.

The name Currant is given to this fruit from its resemblance in form and size to the small kind of grape so called, and already mentioned. The red currant is chiefly used for making jelly. The white currant, being less acid and of a more delicate flavour, is also used as a dessert fruit. A kind of wine, *Currant Wine*, is made from both, and when kept for a considerable time, becomes of very tolerable quality. It is not effervescent, as gooseberry wine is.

The red and white currant are propagated in the same manner as the gooseberry. Like it, they are generally trained as bushes; but bearing fruit chiefly on small spurs, and near the base of the shoots of former years, they are advantageously cut back in pruning, so that only a little portion of any young shoot is left, except when it is wanted to fill up a vacant space, or to increase the size of a bush. They are not only cultivated as bushes, but often trained on walls not suitable for better fruit trees; and on walls with a northern exposure the fruit is of good quality, although late in ripening.

The Black Currant (*Ribes nigrum*) is a native of the northern parts of Europe and Asia. The peculiar flavour of the fruit is disagreeable to some, although very agreeable to others. Jelly or jam made of it is very pleasant, and is esteemed as a kind of domestic medicine for colds and sore throats, for which black currant vinegar, made by steeping black currants in vinegar, and boiling with sugar, is still more useful. The black currant is very generally cultivated in Britain, but to a greater extent in Scotland than in England. It is sometimes allowed to grow as a bush, sometimes trained against a wall. It is to be seen in the gardens of the peasantry, in elevated situations, where no other fruit-producing shrub is cultivated. The fruit of the black currant is chiefly produced on the wood of the former year, and therefore the bushes must not be cut back in pruning, but the older branches are removed to make room for new ones.

The varieties of the black currant in cultivation are not very numerous, nor do they differ much, although some are preferable on account of their larger size. A variety with greenish fruit is occasionally to be seen, and is said to be found wild in Russia.

Many other species of the genus *Ribes* produce edible fruit, but the species mentioned are the only ones which have been cultivated on this account.

The different kinds of edible ·berries are very numerous, so that it is impossible, within the limits of the present work, to give any account of them. Except those which have been already mentioned, however, few true berries are much cultivated, although there are other valuable fruits, presently to be noticed, which popularly bear that name. Of the berries, properly so called, which are found in temperate countries, many species belong to the natural order *Vaccineaceæ*. One of these is the Bilberry (*Vaccinium myrtillus*), called *Blaeberry* in Scotland, which abounds in many hilly and moorish parts of Britain. Another common British species of the same genus is the Red Whortleberry or Cowberry (*V. vitis idæa*), abundant on many dry barren moors. The plants which produce these berries are small beautiful shrubs, as are the other species of this genus, of which there are very many species, widely distributed over Europe, the northern parts of Asia, and North America. The fruit of all the species is eatable; that of some is sweetish, with little acidity; that of a few, as the red whortleberry, is very acid. The berries of the red whortleberry are used for making tarts, like cranberries, and are sold under the name of cranberries in Aberdeen, in the neighbourhood of which they are abundantly produced. The Cranberry (*Oxycoccus palustris*) is a plant of the same natural order, a shrub, but with stems like packthread, creeping among the moss of bogs. The fruit is highly esteemed, and great quantities are collected in some parts of the north of Europe, from which they are imported into Britain. The berries are gathered by means of wooden rakes, in places where the plant grows in abundance. It is found in many parts of Britain, but is nowhere very plentiful, and is less so now than it once was, owing to the reclaiming of bogs. The American Cranberry (*Oxycoccus macrocarpus*) is a larger plant than the common cranberry, and has a larger fruit, but of similar quality, acid, and of fine flavour. It is a native of North America, and has been sometimes cultivated in Britain. Its cultivation requires an abundant supply of water, but is very easy where there is a streamlet or pond.

The Carambola (*Averrhoa carambola*) is a shrub about fourteen feet high, a native of the East Indies, of the natural order *Oxalidaceæ*, the same to which the wood-sorrel belongs. It is much cultivated, not only in its native country, but now also in South

America. The flowers are eaten in salads. The fruit is a berry, about the size of a hen's egg, with five acute angles, a yellow smooth rind, and a watery pulp, which in some varieties is sweet, in others acid. It is very generally known amongst Europeans in India as the Coromandel Gooseberry. This fruit is cut in pieces, and cooked with sugar and wine, or with milk. The Bilimbi, or Cucumber Tree (*Averrhoa bilimbi*), is another species of the same genus, cultivated for its fruit in India, of which country it is a native, and now also in other tropical countries. It is a shrub only about eight feet high, and the fruit is in size and shape like a small cucumber. The fruit is eaten when ripe, or is gathered when unripe, and preserved in sugar or in vinegar.

The natural order *Passifloraceæ*, commonly called Passion-flowers, and of which some species, shrubby climbing plants, are common ornaments of our hot-houses, contains several species having large berries, much esteemed fruits of tropical countries, particularly of the West Indies and South America, where they are all known by the name of Granadilla. *Passiflora quadrangularis* is the Common Granadilla, or Granadilla vine of the West Indies. The fruit is of an oblong shape, about six inches in diameter. The skin is greenish yellow, soft, leathery, and very thick; the pulp, which is the eatable part, is of a purple colour, sweet, slightly acid, and with a very pleasant flavour. It is often eaten with wine and sugar. The fruit of *Passiflora maliformis*, the Apple-fruited Granadilla or Sweet Calabash, is used in the same way. It is about two inches in diameter, and of a dingy yellow colour. *P. laurifolia* is the Water Lemon of the West Indies, called *Pomme de Liane* by the French, and known in South America by the name Murucuja. It is much cultivated in South America. The fruit is about the size of a hen's egg, but more elongated. It is yellow, and dotted with white spots. The pulp is watery, and is generally sucked through a hole in the rind. It has a sweetish aromatic flavour, which is very agreeable, and not only quenches thirst, but excites the appetite for food. *P. edulis* is another species producing a good fruit, which is about two inches long, of a livid purple colour, with an orange-coloured pulp, sweet and somewhat acid.

The term Berry is popularly applied to many fruits which are not botanically of that description. Of these, one of the most valuable is the Strawberry. There are several species of strawberry, natives of temperate parts of the northern hemisphere. The cultivated varieties are very numerous, and in many cases it is extremely difficult, or indeed impossible, to determine to which of the original species they are to be referred. The species are very similar; they are herbaceous plants, having leaves with three leaflets, and long runners, which take root in the ground, and form new plants. The fruit is a succulent *torus*, on the surface of which the seeds are produced. The strawberry belongs to the great order *Rosaceæ*, and its flower exhibits all the general characters of that order. The only species which can be confidently regarded as a native of Britain is the Wood Strawberry (*Fragaria vesca*), common in many parts both of England and Scotland, and probably the parent of many of the cultivated varieties. The other species supposed to have given origin to the cultivated strawberries, are the Hautbois (*F. elatior*), the Scarlet Strawberry or Roseberry (*F. Virginiana*), the Pine Strawberry (*F. grandiflora*), and the Chili Strawberry (*F. Chilensis*), all of which are natives of different parts of America. *F. elatior* is naturalized in many places in Britain. These species of strawberry differ very little, however, from each other; and they seem to intermix very readily in cultivation, so that many of the cultivated varieties are hybrids. New varieties are continually produced, some of them remarkable for large size, and others for fine flavour. The Alpine Strawberry (*F. collina* or *F. semperflorens*), a native of the central parts of Europe, differs very much in habit from the other species. The plants are taller and less spreading, the leaves more hairy, and the fruit small, produced in great abundance, red or white, of delicate but not strong flavour, and, unlike other strawberries, ready to fall off almost on being touched. The Alpine strawberry grows well in very shady situations, and is valued as yielding fruit long after all other kinds, continuing to produce fruit, when the weather is mild, even to the beginning of winter. It makes an excellent preserve, as do also all the other kinds of strawberry. The small kinds are generally preferred for this purpose.

The Mulberry belongs to the natural order *Urticaceæ*, or, according to some botanists, to the order *Moraceæ*, which, however, is commonly regarded as a mere sub-order of *Urticaceæ*. The order *Urticaceæ*, which derives its name from the Nettle (*Urtica*), contains many species, very different in habit and appearance, although agreeing in their most important botanical characters, and very generally characterized by the fibrous nature of their inner bark, some of them yielding valuable fibres. Some of them, as the nettles, have small dry fruits; others have succulent fruits, as the mulberry and fig. The Common or Black Mulberry (*Morus nigra*) is a native of Persia, and other warm, temperate parts of Asia; but is now cultivated in the south and middle parts of Europe, and in the temperate parts of Asia and America. In Britain, its cultivation hardly extends farther north than the middle counties of

England. It requires a wall in Scotland. It is a small tree, with rough, heart-shaped leaves—sometimes entire, sometimes lobed—and dark purple fruit. The fruit is a spike, composed of a succulent axis, with which the calyxes and carpels are conglomerated, the produce of many flowers combined together. It is almost black when ripe. The tree lives to a very great age. There are mulberry trees in England which are at least 300 years old. The fruit is often produced in extreme abundance. It is much esteemed for the dessert ; and a pleasant light wine is made from it. The Red Mulberry (*Morus rubra*) is a native of North America. The tree attains a height of sixty feet, and is valuable for its timber. It is more hardy than the black mulberry, and is therefore preferred for cultivation in the more northern parts of Europe, although it is seldom seen in Britain. The fruit is of a deep red colour, and is almost as pleasant as that of the black mulberry. The White Mulberry (*M. alba*) is a native of China, and was introduced into the south of Europe with the silkworm, for which its leaves are the best food. The fruit, which is almost white, is very inferior to that of the black mulberry. A rob is made of it, which is good for sore throats. There are other species of mulberry, which produce good fruit, natives of India, Central Asia, Madagascar, Mauritius, and South America.

Many species of the genus *Rubus*, of the natural order *Rosaceæ*, produce good fruit. The fruit consists of small drupes, adhering together, and placed upon what is botanically called a *torus*. The Raspberry (*R. idæus*) is the only species generally cultivated. It is a native of woods in Britain, and in most parts of Europe, and has long been in cultivation. The stems are biennial, producing fruit in their second year, and dying after they have produced it ; so that the chief care of the gardener is to provide a succession of new stems, thinning them out that they may not choke each other. There is almost no garden in Britian without raspberries, and the uses of the fruit do not need to be stated. The raspberry thrives best in a light, free, loamy soil, moderately rich, and in a somewhat shady, yet open situation. There are many varieties in cultivation, some with red, and some with white fruit, much larger than that of the wild kind, which is always red. To the same genus belongs the Bramble, a very common native of Britain, of which, according to some botanists, there are many species, whilst others reduce them all to one—*Rubus furticosus.* The brambleberry—commonly called Blackberry in England—is, perhaps, the finest of our wild fruits, and the jam made of it is of delicious flavour. Brambleberry wine is also one of the best of the home-made wines of Britain.

The fruit is probably capable of being much improved by cultivation, but its cultivation has seldom been attempted. Many species, similar to the raspberry and the bramble, are found in the temperate parts of the northern hemisphere. The Dewberry (*R. cæsius*) is a common native of Britain, and its fruit is very sweet and pleasant, much resembling that of the bramble. *R. villosus* and *R. trivialis* are the most common species of North America. The Stone Bramble (*R. saxatilis*) is a perennial herbaceous plant—plentiful in some of the northern and mountainous parts of Britain—with fruit resembling the raspberry. It is sometimes called the Roebuck-berry. Another herbaceous species is the Cloudberry (*R. chamæmorus*), found only in high mountainous situations in Britain, but abundant in many parts of the north of Europe. Its fruit is much esteemed by the Laplanders, and generally throughout Norway and Sweden. Perhaps the finest fruit of the whole genus is that of *R. arcticus*, a very rare British plant, but plentiful in the most northern parts of Europe and in Siberia. In Siberia it is known by a name which may be translated Prince-berry. The plant is of very humble growth, and herbaceous, with creeping roots. Attempts have been made to cultivate it in the gardens of Britain, but with little success, as, although it grows well enough, it seldom produces fruit. Fruit, however, has been obtained in abundance, by planting it in pots, and keeping them in a cold frame till the time of flowering. Jelly, syrup, and wine made of this fruit are in very high esteem in Sweden.

The Prickly Pear or Indian Fig (*Opuntia vulgaris*) is one of the most common fruits of tropical and sub-tropical climates. It belongs to the natural order *Cactaceæ*, an order of very peculiar appearance, which, however, is nearly allied to *Grossulariaceæ*, and the fruit is similar in structure to gooseberries and currants. The *Cactaceæ* are all natives of the warm parts of America, and in some places large tracts of country are almost exclusively covered by them. They have succulent stems, angular, flattened, globular, or depressed, generally destitute of leaves, but covered with prickles. On account of their curious appearance, many of them are common hothouse plants in Britain, some of them being also cultivated on account of the great beauty of their flowers. The fruit of all the species is wholesome; that of some is pleasant, being sweet and agreeably acid. The prickly pear has been naturalized in the south of Europe, and the fruit is brought to market abundantly in Naples. In Sicily it is esteemed as one of the most valuable of esculents, and is a chief article of food during three months of the year. The plant now covers wide expanses of volcanic sand, where almost nothing else will grow. It is of very rapid growth, and, on account of the prickles with which it is covered, is much used in many warm countries to form fences, which are so close, thick, and prickly, that neither man nor beast can force a way through them. The fruit is about the size of a fig, of a greenish colour, with red pulp. In North America, the cultivation of the prickly pear extends as far north as New Jersey. The fruit of *Cactus speciosissimus,* which is much cultivated in Britain as a greenhouse plant, on account of the beauty of its flowers, is delicious. The Strawberry Pear (*Cactus triangularis*) is reputed as the finest-flavoured fruit of this order.

CHAPTER L.

SUCCULENT FRUITS—THE FIG.

THE Fig (*Ficus carica*) is closely allied to the mulberry, belonging to the same natural order and sub-order. The fruit of the fig, however, is as different in structure from that of the mulberry, as it is in appearance. The characteristic of the genus is to have the flowers within a top-shaped receptacle, which enlarges to become the fruit. The flowers therefore are not visible, unless the receptacle is cut up; all that is seen is a little green bud, within which the parts of fructification are developed.

The fig is generally supposed to have been first cultivated in central Asia, its native country, and to have been thence introduced into Europe and other countries. Its cultivation dates from the most remote antiquity; and it still affords to the inhabitants of Syria, as it did in the days of David, not only an article of luxury, but an important article of food.

Figs were regarded by the ancient Greeks as among the necessaries of life.

The cultivation of the fig extends over a considerable range of climate, but is chiefly carried on in the warmer parts of the northern temperate zone. In the countries most suitable to it, the tree produces two or three crops annually, the first crop on shoots of the former year, the second on that of the present year. In colder climates only one crop is produced, or at least is ripened. The fruit is produced from the *eyes* of the shoots.

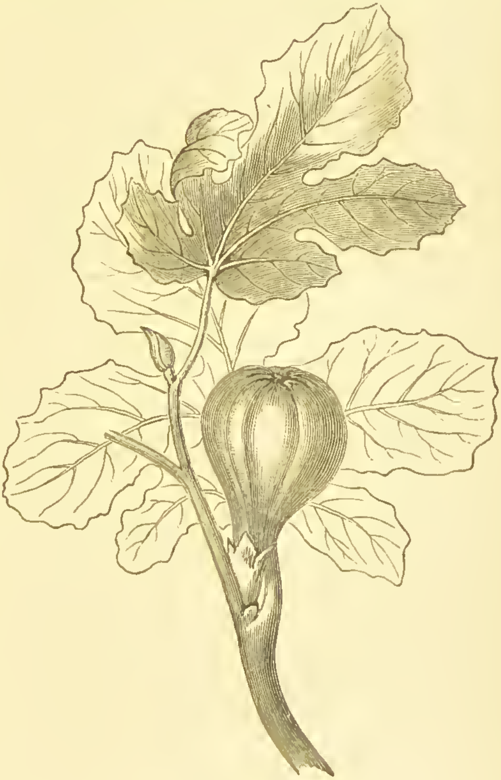


FIG. 21.—THE FIG.

The fig is assiduously cultivated in the neighbourhood of Paris, which is near its northern limit ; and to preserve the branches from the frosts of winter, it is there customary to lay them down in the earth, and cover them with it, the trees being kept low for this purpose. But if cut down to the ground by frost, the fig tree soon springs again from the root. In Britain the fig is cultivated only to a very small extent, and in the northern parts only as a wall tree or in hothouses. In a few places in the south of England, however, there are fig orchards which bear good crops; and in the south-east of Scotland, good crops are sometimes obtained from trees on the open wall. The fig is in general a low tree, with very crooked or gnarled branches; and in the few fig orchards of England it appears rather as a bush than a tree, although some fig trees in England have attained the height of fifty feet. The foliage of the fig is rich and beautiful, and its palmate leaf often appears in painting and sculpture, along with that of the vine. The vine and the fig were associated by the ancient Greeks and Romans with the ideas of plenty and joy; and the same association is beautifully expressed in the Scripture promise of the times of peace, when every man shall sit under his own vine and under his own fig tree, none making him afraid.

It is commonly said that the fig was first introduced into England by Cardinal Pole, early in the sixteenth century; but it is not improbable that it was introduced at an earlier date, and even by the Romans. The fig is not cultivated to the extent that might be expected in the United States of North America. The supply of dried figs for the markets of the world is mostly derived from the coasts of the Mediterranean. They are a great article of export from Turkey, Italy, Spain, and even from the south of France.

The fig tree is propagated by suckers, layers, or cuttings. A layer from a fruitful branch produces a tree, which itself becomes fruitful in a short time. The fig succeeds best in a light and loamy soil, and requires a very free exposure to sun and air.

The varieties in cultivation are numerous, although not so numerous as might be expected in a tree which has been so long cultivated. They differ considerably in the size of the fruit, and also in its form, some being globular, others oblong or conical; whilst some are of a dark purple colour, others brown, red, yellowish, or almost white.

Various other species of *Ficus* produce edible fruits, although none of them is nearly equal in value to the fig. *F. sycamorus* is the Sycamore tree of Scripture. It is a very large tree, abundant in Egypt, Syria, and other parts of the East. Its fruit is red, about the size of a hen's egg, and is a very common article of food in the countries in which the tree grows, although insipid. A kind of wine is made from the fermented juice of the sycamore. A kind of spirit is in some countries also made by distillation from the fermented juice of the common fig.

The Peepul of India (*F. religiosa*) is a species of fig. To the same genus belongs the Banyan (*F. Indica*), so celebrated for its manner of growth, its branches sending down straight shoots, which take root in the ground, until the tree has a multitude of stems, supporting an immense canopy of branches and foliage. In tropical countries, particularly in India, figs of various species are extremely abundant, and every ruin is soon covered with their luxuriant vegetation. The India-rubber tree of India is a species of this genus (*F. elastica*), with beautiful large unlobed leaves.

CHAPTER LI.

SUCCULENT FRUITS.—THE PINE-APPLE.

THE Pine-Apple or Ananas (*Ananassa sativa*) belongs to the natural order *Bromeliaceæ*, an order of tropical endogenous plants, most of which have long, thick, rigid, channelled leaves, often spiny on the edges, and clustered at the base of the stem. The leaves of some species are valuable on account of the fibre which they yield, and which is employed, in the East Indies and other countries, for the manufacture of cordage and of cloth. The fibre of the pine-apple itself is capable of being used for these purposes. The plant, however, is chiefly esteemed for its fruit, which is one of the finest of fruits, having an exquisite flavour, along with an agreeable mixture of sweetness and acidity. The pine-apple is a native of sandy maritime districts in the north-eastern parts of South America; but is now diffused over many tropical countries, and is completely naturalized in some parts both of Asia and of

Africa, forming low thickets through which it is not easy to pass. It delights in a moist climate, and does not succeed well in the dry atmosphere of the south of Italy, although the heat is quite sufficient for it. In Europe, it was first cultivated in Holland, by the aid of artificial heat, and was introduced into England in the end of the seventeenth century. In its cultivation, a tropical heat must be constantly maintained. It is often cultivated in hothouses specially devoted to the purpose, and called *Pine-stoves* or *Pineries;* also in flued pits, and sometimes even in hotbeds, continually kept as hot as possible by fresh supplies of tanners' bark and other such materials. Great care is requisite in its cultivation, as the fruit is otherwise austere, somewhat acrid, and fibrous. Pine-apples produced without due care in cultivation are sometimes not as good as a young turnip, and are almost quite destitute of the exquisite flavour which belongs to the fruit in its best state. Pine-apples are now imported in large quantities from the West Indies; but those imported are generally much inferior to those produced in British hothouses, because of the little attention paid to their cultivation. The increasing importance of this fruit, however, as an article of export from the West Indies, has led to a more careful cultivation and a great improvement of quality. The pine-apple has been much improved by cultivation, and the fruit of the finest cultivated kinds is very different from that of the wild plant.

The fruit is formed of the calyces and bracts of a close spike of flowers, crowning the solitary central stem of the plant, which combine together to form one fruit; and the name pine-apple is derived from its resemblance to the cone of a pine tree. From the summit of the fruit there springs a crown of small leaves, and a new plant is readily obtained by planting this in the ground. New plants are also obtained from suckers. When a plant has ripened its solitary fruit, it is thrown away, and a new one substituted for it. Until a very recent date, the universal practice of gardeners was to cultivate the pine-apple in pots, plunged in tanners' bark, and three years elapsed ere a crown or sucker produced fruit. It is now cultivated in beds, and fruit is obtained in about fifteen months after planting.

The varieties of pine-apple differ much in the size and form of the fruit. Some of them have been regarded by some botanists as of distinct species; but this must be held very doubtful. No other species of the *Bromeliaceæ* yields a valuable fruit.

From the juice of the pine-apple a spirituous liquor of delicious flavour is made, called Pine-apple Rum.

CHAPTER LII.

SUCCULENT FRUITS.—THE GOURD TRIBE.

THE natural order *Cucurbitaceæ*,—an order of exogenous plants,—contains many species which produce valuable fruits, used not merely as articles of luxury, but in many warm countries as principal articles of food. The plants of this order, popularly known as the Gourd Tribe, are mostly annual herbaceous plants, with long climbing or trailing stems, and large rough leaves. Perhaps the finest fruit of the order is the Melon (*Cucumis melo*), which is supposed to be a native of the subtropical parts of Asia, although it has never been found wild. It has been long cultivated, and was introduced into Britain from Jamaica—of which, however, it is certainly not a native—about A.D. 1570. It was originally known by the name of Musk Melon, from its peculiar musky odour. There are many varieties in cultivation, some having a smooth and some a warty rind; the rind of some thick, and that of others thin; that of some cracked in a net-like manner; the flesh of some red, that of others green, yellow, etc.; and the size varying from three inches to a foot or more in diameter. The melon grows in the open air in the most southern parts of England, requiring, however, the aid of a hotbed in spring. It is much cultivated in hotbeds in Britain, and with great care, in order to the production of fine fruit. The particulars of its cultivation it does not belong to the purpose of the present work to state.—The Water-melon (*Cucumis citrullus*) is rather more tender than the melon, and is rarely cultivated in Britain; but in almost all warm countries, it is much cultivated and highly esteemed, not merely as an article of food, but for quenching thirst. It is much more juicy than the melon, whence its name. It is supposed to be a native of the warm parts of Asia. A similar species, the water-melon of South Africa (*Cucumis Caffer*) is highly valued in its native country. The Chate (*C. chate*), a native of Egypt and Arabia, may be described as intermediate in quality betwixt the melon and the water-melon. The Kaukoor (*C. utilissimus*) is an Indian species, much cultivated in some parts of India. It has an oval fruit about six inches long, much like the melon in flavour. The fruit will keep for several months, and is used both raw and in curries. The seeds contain much farina and oil, and are ground into meal, so that the plant may be reckoned amongst the occasional substitutes for corn. The seeds of other species of this genus possess similar qualities, although this is the only one used in this way.

The Cucumber (*Cucumis sativa*) is of the same genus as the melon, but its fruit is of very different quality, having little sweetness, but of a peculiar fine flavour. It is a native of the middle and south of Asia, and is there a principal article of food, as it is also in the south of Europe, and in other countries into which it has been introduced. It is unnecessary to give a description of a fruit so well known. The cucumber has been cultivated from times of very remote antiquity. It is cultivated in fields in the neighbourhood of London, for the supply of the London market; but in the northern parts of Britain it requires a hotbed. Young cucumbers—called Gherkins—are much used for pickling. *Cucumis anguria* is a West Indian species of the same genus, with fruit somewhat similar in quality to the cucumber. The fruit is of the size of a pullet's egg, and is chiefly used in soups.—The Snake Cucumber (*C. flexuosa*) much resembles the common cucumber, but is remarkable for the great length and flexuous form of its fruit. Other species, somewhat similar in quality of fruit, are cultivated in tropical countries.

The species generally known as Gourds, belong to the genus *Cucurbita.* The Common Gourd, or Pumpkin (*C. pepo*), is a native of the Levant. It has a smooth, globose, or pear-shaped fruit, in some varieties not larger than a large apple, in others attaining a weight of seventy pounds. It is cultivated both in gardens and in fields, in all parts of the world warm enough for it, and its cultivation extends rather farther north than that of the cucumber. Even in Scotland it may be cultivated in the open air, with the aid of a hotbed in spring. The fruit is an important article of human food ; and is also used, along with the superabundant shoots and leaves, for feeding cattle. In many countries it is a principal part of the food of the poorer classes, but is also much used even by the most wealthy. It is made into pies with sugar and spices, or is sliced and fried with oil, or boiled and mashed like the turnip, or employed as a principal ingredient in soups. The Vegetable Marrow (*C. ovifera*, or *C. succada*) is probably a mere variety of the pumpkin. It was introduced into Europe from Persia in the beginning of the present century, and is now more generally cultivated than any kind of gourd, being more hardy than the other kinds, and of excellent quality. When full grown, the fruit is generally about nine inches long and four inches in diameter, its rind very smooth. The young fruit—which the gardener removes, in order to allow a few selected fruits to attain their full size and maturity—is very good as a boiled vegetable. The Great Gourd (*C. maxima*), the *Potiron* of the French, is much cultivated in the south of Europe, and used for culinary purposes. A variety called the Great Yellow Gourd, sometimes attains a size of more than eight feet in circumference, and a weight of more than 200 pounds. Its form is that of a somewhat flattened globe. The Squash (*C. melopepo*) differs from the rest of the genus, and from most of the order, in its bush-like habit of growth. The fruit is extremely flattened, and assumes curious shapes, from which one variety is called, in Germany, the Elector's Hat, and another the Turk's Cap. The squash is one of the finest of the gourds. The young shoots and leaves of this and of other gourds are a good kind of greens.

CHAPTER LIII.

SUCCULENT FRUITS.—THE ORANGE TRIBE.

THE natural order *Aurantiaceæ* produces a number of valuable fruits. It is an order of exogenous plants,—trees and shrubs, with smooth evergreen leaves, which are generally simple, and abound in little vesicles containing a fragrant volatile oil. Similar vesicles —oil-cysts—are always abundant also in the flowers and in the rind of the fruit. From this oil the flowers and fruit derive a peculiar fragrance, which differs considerably in different species, and in different parts of the same plant ; but a general similarity of fragrance pervades the whole order. The fruit is of a peculiar structure, which it is not necessary here to describe, but of which the orange and lemon afford familiar examples. It is called by botanists a *hesperidium*, and more nearly resembles a berry than any other kind of fruit. Almost all the species of this order are natives of the warmer parts of Asia; a few, however, are found in Madagascar. About one hundred species are known. Some of them are commonly cultivated in all tropical and subtropical countries.

The Sweet Orange (*Citrus aurantium*) is a native of the forests of the Himalaya and of China. It is a small tree, and, in its wild state, has prickly branches, but the prickles disappear in cultivation. The beauty of its leaves and pure white flowers is well known; and it is almost unnecessary to mention that the flowers are often used for bridal wreaths. A particular description of the plant is unnecessary. When few exotic evergreens had yet been introduced into Britain, the orange was often to be seen in the windows of houses as well as in greenhouses; but other shrubs are now generally preferred, although the orange still retains a place in the greenhouse as an object of curiosity. It is not generally cultivated in hothouses in Britain for the sake of its fruit, because of the abundance of fine fruit imported from the south of Europe and the Azores. No fruit, except perhaps the apple, is more easily preserved for a long time, and thus the orange has become a very considerable article of commerce. It does not appear to have been known to the ancient Greeks and Romans, but was probably introduced into the south of Europe by the Moors, and into Italy so recently as the fourteenth century,—more than 1000 years after the introduction of its congener the Citron. It is now very extensively cultivated in all parts of the south of Europe. In the north of Italy, orange trees are protected from the frosts of winter by temporary houses of boards; and, with the protection of screens of board or reeds in winter, they are grown as wall trees in a few places in the south of England. Oranges are said to have been first imported into Britain in the end of the sixteenth century, by Sir Walter Raleigh; and, soon after, orange trees were planted at Beddington, in Surrey, by Sir Francis Carew, in front of a wall screening them from the northern wind, and these trees produced good fruit for many years, but were destroyed by a severe frost in the winter of 1739–40. Orange trees are similarly cultivated, with winter screens, in some places in Devonshire, and elsewhere in the south of England. They produce fruit as good as that imported from the shores of the Mediterranean. There are numerous varieties of the orange in cultivation, some of which are well known by distinctive names in our shops. The varieties are perpetuated by grafting upon seedling orange stocks and by layers. The most common kind is the Portugal or Lisbon orange, of which there are many sub-varieties. The St. Michael's Orange, chiefly produced in the Azores, and deriving its name from one of these islands, has a very smooth rind, with few oil-cysts, a light-coloured pulp, and a delicious flavour. The China Orange has a rind still thinner and smoother. The Blood Orange, much cultivated in Malta and Provence, is remarkable for the blood-red colour of its pulp. It is largely imported into Britain, and is one of the most esteemed kinds of orange. The Tangerine Orange is a small flattened kind, of agreeable flavour.

Orange trees are extremely fruitful. A tree twenty feet high, and extending its branches over a space of only six feet around, has often been known to yield from 2000 to 3000 oranges in a year. The tree attains an age of at least 150 years. Old trees are more productive than young ones, and yield finer fruit.

The commercial importance of the orange is greater than that of any other fruit, except perhaps the apple. Besides being one of the most delicious and wholesome of fruits, it is capable of being long kept, and transported without injury from one country to another.

The Bitter Orange, also called Seville Orange and Bigarade Orange (*Citrus vulgaris* and *C. bigoradia* of botanists), is probably a mere variety of *Citrus aurantium.* The leaves are more truly elliptical than those of the sweet orange. The flowers are more beautiful and fragrant, and the fragrant volatile oil called *Oil of Neroli* is obtained from them. *Orange-flower Water* is also mostly made from them. The pulp of the fruit is acid and bitter, so that the fruit is not eatable; but its rind is much used for making a kind of marmalade, for the sake of which it is imported in considerable quantities into Britain.

The Mandarin Orange or Clove Orange (*Citrus nobilis*) has fruit of breadth much exceeding its length, and with a thick rind very loosely attached to the flesh. The juice is sweet, and the rind is also sweet and eatable. The leaves are smaller than those of any other kind of orange. The Mandarin Orange has recently been introduced into British hothouses from China.

The Bergamot or Bergamot Orange, also called Mellarosa, is by some botanists regarded as a distinct species (*Citrus Bergamia*), by others as a variety of the orange or of the lime. It is cultivated in the south of Europe, but chiefly for the sake of the volatile oil—*Oil of Bergamot*—obtained from its extremely fragrant rind. The fruit, however, which is pear-shaped and smooth, has a sub-acid, fragrant, and rather pleasant pulp.

The Citron (*Citrus medica*) is a larger tree than the orange, and its fruit is much larger; that of the largest varieties being sometimes nine inches long, and twenty pounds in weight. Some of the varieties are known by the name of Cedrate. The citron is frequently cultivated in hothouses in Britain, and produces abundance of excellent fruit. The fruit is too acid to be eaten raw, but is much used for making a kind of preserve for which the rind is more valued than the pulp. From the rind, the *Oil of Cedrate,* used in perfumery, is obtained. The juice of the citron is sometimes used for flavouring punch.

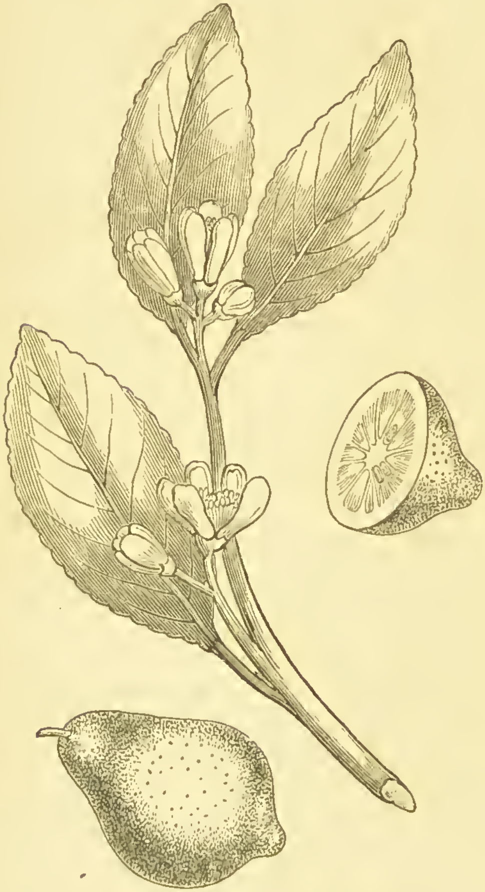


Fig. 22.—The Lemon.

The Lemon is by some botanists regarded as a mere variety of the citron, by others as a distinct species (*Citrus limonum*). It is more hardy than the orange, and good crops are obtained in some places in the south of England from trees trained on a wall, and protected in winter by moveable frames; but its cultivation is little attempted in Britain, owing to the facility with which the fruit, like that of the orange, can be imported from warmer countries. Great quantities of lemons are exported from the south of Europe. Sicily alone exports annually about 30,000 chests, each containing 240 lemons. The cultivation of the lemon extends northwards as far as the Tyrol and the south of France. It is supposed to have been introduced from Asia in the time of the Crusades, but is now almost naturalized in the south of Europe. In some parts of Brazil it is completely naturalized; and the flesh of cattle is often flavoured from their eating the fallen fruit, for which they show a great avidity. The acid juice of the lemon is an important article of sea-stores, being of great value for the prevention of sea-scurvy, formerly so terrible in its ravages amongst sailors during long voyages. It is also much used for making refrigerant draughts in cases of fever, and for making the well-known beverage called Lemonade. The rind of the lemon—*lemon peel*—is candied, and used in the same manner as orange peel.

The Sweet Lemon is generally regarded as a variety of the common lemon, although it has also been described as a distinct species, under the name of *Citrus lumia.* It differs little from the common lemon, except in the sweetness of its pulp. It is cultivated in the south of Europe.

The Lime (*Citrus acida*) is a shrub, with spiny branches, and small, roundish, oval, or oblong fruit, about an inch or an inch and a half in diameter. It is not much cultivated in Europe, but is sometimes used as a hedge plant in the West Indies, where its very acid fruit is much esteemed for flavouring punch, and for making refrigerant drinks. The Sweet Lime (*C. limetta*) is probably a mere variety of it. It is cultivated in the south of Europe, but not extensively, nor is it accounted of much value.

The Lime Juice so much in use for sea-stores, and now also common in our shops, and much valued as a refrigerant drink, is mostly prepared, not from the lime, but from the lemon.

The Shaddock (*C. decumana*), called *Pampelmous* by the French, is one of the largest fruits of this order. It derives its common English name from a Captain Shaddock, who introduced it into the West Indies from China, about the middle of last century. The leaves are large, and the leaf-stalks broadly winged. The fruit is often larger than a man's head, and from ten to fourteen pounds weight. The rind is very thick, greenish yellow, and smooth. The pulp is sweet and subacid, excellent for quenching thirst; and the fruit is a valuable article for sea-stores, as it can be kept longer than even the other fruits of the same genus.

The Paradise Orange, or Forbidden Fruit (*C. paradisi*), is a large pear-shaped fruit, of a greenish yellow colour, with a thick tender rind, which is eatable and pleasant, but with very little pulp, and that extremely acid.

All the species which have been mentioned belong to the genus *Citrus*, the most important by far of all the genera of this order. Other genera, however, produce excellent fruits. That of *Glycosmis citrifolia* is said to be particularly delicious. *Cookia punctata*, the Wampee, is highly esteemed in India and China. *Feronia elephantum*, the Elephant Apple, is much used as an article of food on the Coromandel coast. The fruit is about the size of an ordinary apple. *Ægle marmelos*, the Marmelos or Bengal Quince, also called Bhel, is an Indian tree, producing a large fruit of exquisite fragrance and flavour, which is also said to be very nutritious.

CHAPTER LIV.

SUCCULENT FRUITS.—TROPICAL FRUITS.

SOME of the most valuable fruits of tropical countries have been already noticed ; but the number of tropical fruits is very great, and a full account of them would require a large volume. All that can here be attempted is to mention a few of those most esteemed for their flavour or other qualities, or which are otherwise remarkable.

The natural order *Anonaceæ*—an order of exogenous trees and shrubs—contains several species, natives of tropical parts of Asia, Africa, and America, of which the fruit is known by the name of Custard Apple. The Rough Custard Apple (*Anona muricata*), generally called Sour Sop in the West Indies, is a tree not of very large size, which grows abundantly on savannahs in Jamaica and other West Indian islands. The fruit is large, oval, greenish yellow, covered with small knobs on the outside, and containing a white pulp, which is sweetish and somewhat acid, very cooling and agreeable. In odour and taste it much resembles the black currant. In consequence, apparently, of its great abundance in the West Indies, it is little esteemed by the more wealthy classes, but it is much relished by the negroes. The Sweet Sop (*A. squamosa*) is found both in the East and West Indies. The tree is small, the fruit about the size of a large apple, of a greenish yellow colour, with a thick scaly rind, and a delicious pulp, which is described as 'tasting like clotted cream mixed with sugar.' The Common Custard Apple (*A. reticulata*) is a native of Brazil, but is now cultivated in almost all tropical countries. The fruit is about the size of a small apple. It is so luscious that not much can be eaten at one time. An attempt was made some years since to import custard-apples into Britain from Madeira; 'but whether it was from the dark and not over-attractive exterior of the fruit, or from the price of 3d. or 4d., at which they were sold, not being sufficiently low to permit them to be generally used, it was found to be a failure, and has not since been repeated.'[1] The Cherimoyer (*Anona cherimolia*) is regarded as one of the finest of all tropical fruits. The tree which produces it is a native of Peru, and is now cultivated in some other tropical countries. The fruit is of an irregular heart shape, and often four pounds or more in weight. The eatable part is a soft custard-like pulp.

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[1] Hogg's *Vegetable Kingdom*, p. 28.

The Alligator Pear or Avocado Pear (*Persea gratissima*) of the West Indies, belongs to the natural order *Lauraceæ*, the laurel tribe. The tree is in size like a large apple tree, and has oblong leaves. The fruit is in size and shape like a large pear; the rind is soft, the pulp yellow and pretty firm, with a rich, delicate, and extremely pleasant flavour. It is often eaten with pepper and salt, sometimes with wine and sugar, or with lime juice and sugar. It is one of the finest fruits of the West Indies. The order *Lauraceæ* produces few edible fruits, but is remarkable for its aromatic and odoriferous products; cinnamon, cassia, and sassafras being the bark of stems and roots of certain species, whilst others yield camphor. The beauty of the evergreen leaves is a general characteristic of the order, of which the Common Laurel or Sweet Bay (*Laurus nobilis*), a native of the shores of the Mediterranean, is the example best known in Britain, being a frequent ornament of shrubberies.

The Mammee or Mammee Apple (*Mammea Americana*) is a tree of about sixty or seventy feet in height, a native of the West Indian Islands, and of the tropical parts of America. It belongs to the natural order *Clusiaceæ* or *Guttiferæ*, many species of which are remarkable for their balsamic juices.

The fruit is, in size and shape, like a large apple. The pulp is of a deep yellow colour, pretty firm, and of a delicious flavour, somewhat resembling that of the apricot. It is often eaten in slices or small pieces, with wine and sugar. A syrup is produced from it, which long retains its flavour and odour. It is rather wonderful that this syrup has not become, as it well might be, a considerable article of exportation from the West Indies. A very similar species of Mammee (*M. Africana*), with fruit nearly equal to that of the West Indies in quality, is found in the western parts of Africa.

To the natural order *Clusiaceæ* belongs also the Mangosteen (*Garcinia mangostana*), a native of Sumatra and other islands of the Eastern Archipelago. It has been introduced into Ceylon, and has produced fine fruit there. The mangosteen is one of the most exquisite of fruits. The tree is of rather small size, with undivided leaves about eight inches long and four inches broad. The flowers resemble those of the rose, and are of a dark red colour. The fruit is round, about the size of an orange, of a brown colour, with grey or yellow spots. It has a thick rind, and soft juicy pulp, which has been described as resembling a mixture of grapes and strawberries, or of the pine-apple and the peach. The mangosteen is a very wholesome fruit; a large quantity may be eaten with impunity, and it is given to fever patients when they are incapable of receiving almost any other aliment. Other species of *Garcinia* produce fruits somewhat similar, but inferior.

The Durion (*Durio zibethinus*), a tree of the natural order *Sterculiaceæ*, produces another of the most esteemed fruits of the south-east of Asia and the Malayan Archipelago. The tree somewhat resembles a pear tree, and has leaves like those of a cherry, but entire at the edges. The fruit is often as large as a man's head, and the rind is covered with tubercles and soft spines. The pulp resembles a kind of blancmange. The durion must be eaten when quite fresh. It putrifies in less than twenty-four hours. Europeans generally dislike it at first, owing to its peculiar odour, which has been compared to that of decaying animal matter, or of rotten onions; but this repugnance is generally soon overcome, and the flavour is enjoyed. The seeds of the durion, when roasted, have nearly the same taste as chestnuts.

The Akee (*Blighia sapida* or *Cupania sapida*) is a fruit-tree of Guinea, and was introduced into Jamaica by Captain Bligh in 1793. The fruit is much esteemed both in Africa and in the West Indies. The akee belongs to the natural order *Sapindaceæ*, an order of exogenous plants remarkable for the saponaceous principle which the fruits of some of them contain, as the Soapberry (*Sapindus saponaria*) of the West Indies and South America, the fruit of which will cleanse more linen than sixty times its weight of soap. The akee is a tree about thirty feet in height; the leaves resemble those of the ash; the flowers are small and white, and are produced in branched spikes; the fruit is about the size of a hen's egg, oblong, ribbed, and compressed in the middle, of a dull orange colour. It contains several large seeds, with a slightly acid aril, of a rich and extremely grateful flavour.

To the same order belongs the Litchi (*Nephelium litchi*), one of the finest fruits of the East. The tree is a native of China and the eastern parts of the East Indies. The fruit is of the size of a date, and grows in loose spikes. It has a hardish, scaly rind, and a delicious, sweet, and subacid pulp. The Chinese preserve the fruit by drying it like prunes. The dried fruit is imported into Britain, and retains much of the richness of flavour which belongs to the fresh fruit. The litchi is extensively cultivated in the southern provinces of China, and in the northern parts of Cochin-China. The fruit, preserved in tin cases with spirits and honey, is carried to Pekin for the use of the Emperor of China, and growing trees are also carried to Pekin, the fruit of which is ripe when they arrive.

Of the same genus with the litchi is the Longan (*Nephelium longan*), also a native of China, and highly esteemed in that country for its delicious fruit. Inferior to it, but still a very good fruit, is the Rambutan (*N. lappaceum*), which is extensively cultivated in the East Indies. The fruit is red and hairy, smaller in size than a plum, and grows in clusters. The rind is easily removed. The pulp is white, loose, almost transparent, but tough, and contains a viscid juice with a sweetish acid taste.

To the same order also belongs the Honeyberry (*Melicocca bijuga*), a native of the West Indies, and there much cultivated for its fruit. The tree is only from sixteen to twenty feet high ; the fruit is about the size of a bullace, black, with a very sweet and agreeable pulp. Each fruit contains one large seed which, when roasted, resembles a chestnut in flavour.

The Star Apple (*Chrysophyllum cainito*) belongs to the natural order *Sapotaceæ*, an order of exogenous trees, all tropical. It is a small tree, seldom above ten feet high, with spreading head, and slender flexile branches, a native of the West Indian Islands and of Guiana. The fruit is about the size of a large apple, and is divided into ten cells, each containing a large black seed, surrounded by a gelatinous pulp. It is not generally relished by Europeans, but is much used as an article of food in the countries in which it grows.

Another fruit of the order *Sapotaceæ* is the Mammee Sapota (*Lucuma mammosa*), a large oval fruit, with a luscious pulp. The tree which produces it is also a native of the West Indian Islands and

South America. From the flavour of the fruit, it is sometimes called the marmalade tree. The Sapodilla or Sapota (*Sapota achras*) also belongs to the order *Sapotaceæ.* It is a large tree, with a tall stem, unbranched to a great height from the ground, a native of the same regions with the species of this order already mentioned. The fruit resembles a bergamot pear in shape and size. It is much esteemed in the West Indies. Like the medlar, it is not eaten till it is beginning to decay.

The Papaw (*Carica papaya*) belongs to a small order of exogenous trees, all tropical, and all American, called *Papayaceæ,* of which it is the only valuable species. It is cultivated for the sake of its fruit in the East Indies and in Africa, as well as its native regions. The tree has a hollow stem, rising to the height of about twenty feet, and crowned with a head, not of branches, but, like a palm, of long leaf-stalks which bear leaves formed of seven large leaflets. It is diœcious; that is, the male and female flowers are produced on different trees, as in the date palm. The fruit is about the size of a small melon. When ripe, it is eaten with sugar and pepper; the half-grown fruit is much esteemed for pickling.

The Mango (*Mangifera Indica*) is one of the finest of tropical fruits. It is a native of the East Indies, but is now cultivated in all countries of which the climate is suitable to it. It belongs to the natural order *Anacardiaceæ*, an order of exogenous plants The tree is generally about fifty feet in height, with a spreading crown. The fruit is oval, or somewhat kidney-shaped, about as large as an apple, yellow or reddish, and full of an agreeable, sweetish, and slightly acid juice, which has a rich, peculiar flavour. It is not only used for the dessert, but for making jelly, tarts, preserves, pickles, and chutney. For some of these purposes it is used in an unripe state. Several other species of the same genus produce eatable fruits, but they are all much inferior to the common mango.

To the order *Anacardiaceæ* belong also the Hog Plums, natives of the West Indies and of South America. The Common Hog Plum (*Spondias dulcis*) is a small tree, often used in the West Indies as a hedge plant. The boughs planted in the ground when in flower, take root at once, and in a few months are loaded with fruit. The fruit is a drupe, about an inch in length, ovate or oblong, purple, or variegated with yellow. It is not much esteemed by Europeans, although much eaten by the other inhabitants of the West Indies. It receives the name hog plum from the avidity with which it is devoured by swine. Another species (*S. lutea*) has a yellow fruit, resembling a plum, of an agreeable and aromatic flavour. Nearly allied to them is the Otaheite Apple (*Poupertia dulcis*), a native of Java, the Moluccas, and the South Sea Islands. In the Friendly Islands and Society Islands it is much cultivated. The tree is about thirty feet high ; the fruit large, smooth, of a golden yellow colour, with a sweet, aromatic pulp, having a flavour somewhat like that of the pine-apple ; but its smell is generally disliked by those who are not accustomed to it.

Guavas belong to the myrtle family, the natural order *Myrtaceæ*. There are several species, natives of the East and West Indies. The Common or White Guava (*Psidium pyriferum*) is a small tree not exceeding twenty feet in height, and often a mere shrub of eight or nine feet, much cultivated in the West Indies. The fruit is rather larger than a hen's egg, pear-shaped, very smooth, and of a yellow colour. The rind is thick ; and the pulp flesh-coloured, sweet, aromatic, and very pleasant. The Guava is used as a dessert fruit, and also for making jelly. Guava jelly is imported into Britain from the West Indies. The plant is sometimes cultivated in hothouses in Britain, and produces good fruit. The Red Guava (*P. pomiferum*) has a fruit more like an apple in shape, with a red and very acid pulp, much inferior to that of the white guava. Another species (*P. cattleianum*), a native of China, produces a finer fruit, perhaps the best of the genus. It is about the size of a small walnut, nearly round, and of a deep purple colour. The pulp is soft and fleshy, somewhat resembling the strawberry in flavour. This species has been introduced into Brazil, and is now common there. It succeeds well in hothouses in Britain.

The Tamarind (*Tamarindus Indica*) is a native of the East Indies, but is now commonly cultivated in almost all tropical countries. It belongs to the natural order *Leguminiferæ*, and to the section of it called *Cæsalpineæ*, in which the flowers are not papilionaceous, as in most of the order. The tamarind is a large, spreading tree, from forty to sixty feet high, with pinnate leaves, somewhat like those of the mountain ash. The flowers are produced in loose racemes, and the fruit is a pod, of which five or six are generally produced in a bunch. The edible part is the pulp of the pod. The pod varies from three to six inches in length. Tamarinds are used both as an article of food and of medicine. They are laxative and refrigerant, and, when infused in water, form a very grateful drink in fevers. Tamarinds preserved in sugar are imported into Britain both from the East and West Indies.

These are but a few of the fruits of tropical countries. To mention all, would far exceed the limits of the present work.

CHAPTER LV.

EDIBLE FERNS, LICHENS, FUNGI, AND SEA-WEEDS.

CRYPTOGAMOUS or flowerless plants are so different from all other plants that it seems convenient to notice them separately. The species are very numerous, but few of them are of much economical importance, and they contribute little to the food supplies of mankind, although in this respect some of them might probably be turned to more account than they have hitherto been.

Ferns (*Filices*) more nearly resemble phanerogamous plants than any of the other flowerless orders. They are, however, among the least important in an economic point of view, and only two or three species afford articles of food, nor are these of much value. The young tender fronds of some ferns are used as pot-herbs in the Highlands of Scotland, in the north of Europe, and by the inhabitants of the Himalaya mountains. The fronds of ferns are mucilaginous, slightly aromatic and astringent. The fragrant root-stocks of certain species of Maiden-hair, particularly *Adiantum pedatum* and *A. capillus Veneris*, are used with syrup and orange flowers for making *capillaire*. The root-stocks of some ferns contain much starch, and starch is made from them, or they are used for food, as those of the Tara Fern (*Pteris esculenta*) in New Zealand, and those of *Aspidium* (or *Nephrodium*) *esculentum* in Nepal and other parts of the Himalaya. The stems of some tree ferns,—as *Cyathea medullaris* in New Zealand, and *Alsophila spinulosa* in India,—likewise afford starch fit for food. The Tara Fern closely resembles the Common Brake (*Pteris aquilina*) of Britain, but is of larger size, and its root-stock is more nutritious, although that of the common brake also contains starch, and has sometimes been used, in times of scarcity, ground and mixed with barley, to make bread. The root-stock of the Tara Fern was a principal article of food in New Zealand before European colonists settled in that country. It is prepared for use by roasting, and is the better of being kept for a year in stacks, carefully protected from rain, but with free access of air. A large quantity of a very pleasant kind of flour, mostly consisting of starch, is obtained from it by beating it on a stone till the fibre alone is left.

The Nardoo (*Marsilea quadrifida*) is a remarkable plant, belonging to the natural order *Marsileaceæ*, an order of small plants, mostly aquatic, or growing in moist places, and nearly allied to ferns. No other species of the order is of any economic importance whatever; and probably it is one of the last groups in the whole vegetable kingdom in which any botanist would have expected to discover a plant useful for human food. Yet this plant, which has been recently discovered in Australia, affords much of their food to the natives of some parts of that country, and has been of great use to some exploring parties. It grows in places occasionally covered with water, and vegetates when moisture abounds, covering the ground with green clover-like foliage, the leaves or fronds having three leaflets at the top of a stalk six inches in height. When the water dries, the remains of the plants are often encrusted with dried slime. The spore-cases (seed-vessels) are then gathered for food. They are horny and hard, requiring considerable force to pound them when dry, but soft and mucilaginous when moistened. They are pounded along with the spores (seeds) which they contain, and made into cakes like flour. Whether they are really good, or are only acceptable from the want of anything better, is a question which at present it would be difficult to answer.

Of Lichens, numerous as the species are, only two or three demand notice as contributing in any degree to the supply of human food. One of these is the Reindeer Moss (*Cenomyce rangiferina*) of Lapland, and other countries of high northern latitude. It is found in abundance in the moors of the mountainous parts of Britain, where, however, it is not esteemed as of any value. In Lapland it constitutes great part of the food of the reindeer, and is also sometimes used for human food, being boiled in the milk of the reindeer, with which it forms a kind of jelly, as it consists mainly of a mucilaginous substance. In the most northern parts of the world this plant grows in great luxuriance, and in many places covers the whole surface of the ground. It is a very beautiful lichen, with a white much-branched stem, the extremities of the branchlets bearing round brown *shields* (*apothecia*), the fruit of the plant. The *Tripe de Roche* of the Arctic regions is a lichen of very different appearance, with a spreading, leafy thallus, and round, unstalked shields. There are several species, of which the most important are *Gyrophora proboscidea* and *G. erosa*, both of which are common in the Highlands of

Scotland, growing on rocks in the most elevated situations. *Tripe de Roche* is a considerable article of food of Canadian hunters and voyageurs, as well as of the Indian tribes of the most northern regions. It is nutritious, but bitter, generally nauseous to the unaccustomed palate, and purgative. The only other lichen which claims attention at present is that commonly known as Iceland Moss (*Cetraria Icelandica*), a species plentiful in rocky places on many of the mountains of Scotland, but much more so in Norway and Iceland. It grows on the ground, spreading out in a leaf-like manner, its branches tufted, and rising erect. It affords a good light nutritious food for invalids, being mucilaginous, demulcent, and tonic. It has some reputation as beneficial for consumptive patients. Considerable quantities are, therefore, imported into Britain from more northern regions. No attempt, however, is made to use the produce of the Highland mountains. In Iceland this lichen is a common article of food. The bitterness is extracted by steeping it in water, and it is then reduced to powder, and made into cakes, or boiled and eaten with milk,—the poor people thankfully declaring 'that a bountiful Providence sends them bread out of the very stones.'[1]

The *Fungi* are much more various in properties than the other cryptogamous orders already mentioned. Some of them are very poisonous, others are very wholesome and nutritious. Amongst the poisonous species are some of very small size, parasitic upon other plants, as ergot of rye, valuable in medicine, and different kinds of smut and brand, which destroy the ears of corn. The Blue Mould (*Aspergillus glaucus*), however, which grows upon various decaying substances, and particularly upon cheese, is so far from being reckoned poisonous, that cheese affected with it is rather regarded as improved than injured, and to many palates is rendered more acceptable by its presence. Of the larger fungi, few are poisonous, and these are all of the group to which the Common Mushroom (*Agaricus campestris*) belongs, and are dangerous only from their liability to be mistaken for it. Many sad accidents have happened through mistakes of this kind, although the common mushroom can be easily distinguished by any one at all acquainted with it, either by its appearance or by its smell; the poisonous species of the same genus, and of nearly allied genera, having a repulsive smell, whereas that of the true mushroom is agreeable. Fungi are little used in Britain as an article of food. The common mushroom alone is generally used, being gathered in the pastures in which it grows naturally, and also cultivated in various ways. The Truffle and the Morel are esteemed, but are rare, and never cultivated. There are, however, many species of this order which are good for food, and which are plentifully found in the fields and woods of Britain, but which are almost universally disregarded and permitted to rot. In other countries, some of these are duly appreciated, and generally used. In Britain, the mushroom is a mere article of luxury—roasted, stewed, or made into ketchup; but in some parts of the continent of Europe fungi constitute a chief part of the food of the people at certain seasons of the year. They are also an important article of trade, being brought to the markets of towns in large quantities by peasants. So important is this branch of trade in Rome, that, in the year 1837, the Government instituted a *Congregatione Speciale de Sanita,* charged with the inspection of the fresh fungi brought into the market. The fresh fungi, however, are but a small part of those that are offered for sale; and indeed the dried, pickled, and preserved fungi sell at a much higher price. It has been calculated that fungi are sold in the market-place of Rome to the value of about £4000 sterling annually, and they are consumed in similar quantity throughout all parts of Italy. That they are so little used in Britain is owing to mere ignorance and prejudice, and there can be no doubt that a large quantity of excellent food is thus wasted. Fungi more nearly resemble animal food in their composition than any other productions of the vegetable kingdom. They contain no inconsiderable quantity of *osmazome*, the principle that gives its peculiar flavour to the gravy of meat. A French author, M. Roques, has designated them the *manna of the poor.* That they merit this designation from their use in some parts of Europe cannot be doubted, although in Britain none could be more inconsistent with present facts. Attention, however, ought to be drawn to the value of our esculent fungi, one of the cheapest of all kinds of food, and in many places easily to be obtained. Great care ought to be taken as to the use of any of the Agaric tribe,—that to which the common mushroom belongs; but other kinds may be used with almost perfect confidence.

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[1] Hooker, *Flora Scotica*, ii. 58.

The Common Mushroom (*Agaricus campèstris*) is plentiful in pastures in most parts of Britain. In some years it appears in great abundance, where again in following years it is comparatively rare, in consequence, probably, of the different state of the weather at particular seasons. It has a short, solid, and white stem, with a *cap* (*pileus*), which is at first white, and a little turned in at the edge, but which, as it advances in growth—and the growth, as in all fungi, is very rapid—becomes brown, scaly, and flattened. On the under side of the cap are the *gills*, on which the spores (seeds) are produced. The gills are loose, reaching to the stem on all sides, but not attached to it. They are of a pinky red colour when young, but change to a liver colour when older. In a very young state, when just springing from the ground, it is almost globular; and at this stage mushrooms are popularly called 'button mushrooms,' and are regarded as in their greatest perfection for the table, although for making ketchup much older mushrooms are equally good. Mushrooms vary much in size, from two inches to nine inches, or more, in diameter. Specimens of much larger dimensions have been described; but it is not improbable that they belonged to a coarser species or variety (*Agaricus Georgii*), with thicker stem, and yellowish white gills, which is also abundant in many parts of

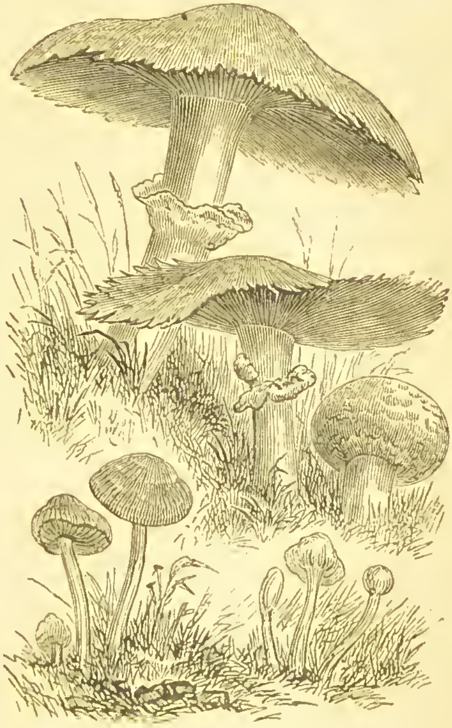

Fig. 23.—The Mushroom.

Britain, and although not unwholesome, and often used for making ketchup, is in every respect much inferior to the common mushroom.

Ketchup is made by breaking mushrooms into small pieces, and mixing them with salt, which causes them to deliquesce, so that nothing solid remains but a little fibre and skin. The liquor is then boiled with spices.

The mushroom is cultivated in beds made of earth and horse-dung, in which it may be expected to spring up from the general abundance of its spores in all places ; but mushroom beds are often *spawned*, or planted with mushroom spawn,—the *mycelium* or underground growth of mushrooms,—which, being mixed with clay, may be kept dry for a long time, still retaining its power of vegetation. *Bricks* of mushroom spawn are sold by market gardeners. Other modes of cultivation of mushrooms are also practised, of which it is impossible here to take notice ; but it may be remarked that the more freely light and air are admitted, and the more nearly that the mode of cultivation resembles the natural growth of the plant, the better is the quality of the produce.

Another edible species of the same genus is the Fairy-Ring Mushroom, or Champignon, also called Scotch Bonnets (*Agaricus oreades*). During many months of the year it is very common in pastures in Britain, forming what are called fairy rings. These seem to be produced by the extension of the *mycelium* of the mushroom from the original centre of its growth, the soil which has once nourished the plant probably becoming less appropriate to it than before. The fairy-ring mushroom is of small size, its stem seldom exceeding an inch and a half in height, and its cap (*pileus*) an inch and a half in diameter. The cap is fleshy, tough, somewhat bossed, pale brown when young, but becoming whiter with age. It is of a very agreeable flavour, and is used for flavouring soups, gravies, and stewed meat. It is commonly used in a dried state, and exposure to the air for a few days is generally sufficient to dry it so that it may be kept for a long time. It is much used in France, although generally disregarded in Britain. Care must be taken to distinguish it from an allied species, *Agaricus dryophilus*, which is of very different quality, being poisonous ; but *A. dryophilus* has a depressed and not a bossed cap, and its stem is hollow, whereas that of *A. oreades* is solid.

Several other British species of *Agaricus* are pleasant esculents. The Blewitt (*A. personatus*) is sometimes brought to Covent Garden market. It grows in pastures, either in clusters, or in large rings, in the end of autumn or beginning of winter. The cap is from two to six inches broad, fleshy and firm, pale bistre or purple lilac, occasionally violet, convex, obtuse, very smooth, and shining as if oiled. The blewitt has a fine rich flavour resembling that of veal. It is prepared for the table by dressing it with savoury herbs and other condiments.

One of the best of edible agarics is *Agaricus deliciosus*, the Orange Milk Agaric, a native of Britain, but seldom used in this country, although in common use in some parts of the continent of Europe. Sir James Smith, in his *Tour*, speaks of the market of Marseilles as exhibiting a prodigious quantity of this fungus, which, he adds, 'really deserves its name, being the most delicious mushroom known.' This agaric has a stem from two to three inches high, slightly bent, marked with little superficial pits, and covered with short pointed hairs at the base. The cap is from three to four inches in diameter, of a dull orange-rufous colour, frequently zoned with circles of a brighter hue. It is full of a red orange milk, which turns green on exposure to the air. This excellent fungus generally grows under old Scotch firs and other pines.

It is impossible here to notice all the other edible species of agaric, even those which are natives of Britain. They will be found described in Dr. Badham's *Treatise on the Esculent Funguses of England*, a book which has been too generally regarded as the mere work of an enthusiast, whilst, in fact, it directs attention to many neglected, but valuable, easily obtainable, and delicious articles of food. In regard to agarics, however, great caution is necessary, and no one should use them without being able accurately to discriminate the kinds, as they are of very different quality, and some poisonous species are easily mistaken by the inexperienced for those which are wholesome. It may be mentioned, however, that among the edible species are *Agaricus prunulus*, the *Muceron* of the French, *A. procerus*, *A. nebularis*, *A. heterophyllus*, *A. ruber*, *A. virescens*, *A. ostreatus*, *A. rubescens*, and *A. orcella*. There are others, which, although not of much use in any other way, are good for making ketchup. *A. prunulus*, perhaps, deserves special notice. It has a white, robust, solid stem, and a cap sometimes from four to six inches broad. In Italy it is prepared in a variety of ways for the table when fresh, and is also dried for making gravy and flavouring dishes. When dried, it is sold at a price equalling from ten to fourteen shillings a pound. *A. prunulus* is very easily distinguished by its botanical characters, and is little likely to be confounded with any dangerous species, from the circumstance of its appearing in spring, whereas other mushrooms mostly appear in the latter part of summer and in autumn. It grows chiefly in the borders of woods.

Among the most esteemed of esculent fungi are several species of Morel (*Morchella*). They differ very much in characters and appearance from agarics, having no gills, but so far resemble them as to have a stalk and cap. The surface of the cap is irregularly pitted, and it is here that the spores are produced. The common morel (*M. esculenta*) is found in woods in the beginning of summer, and is not unfrequent in Britain, although it is much more common in some parts of the continent of Europe. It is occasionally brought to Covent Garden market; but in most parts of the country, owing to the ignorance which prevails on the whole subject of esculent fungi, it is utterly neglected. Yet dried morels are imported into

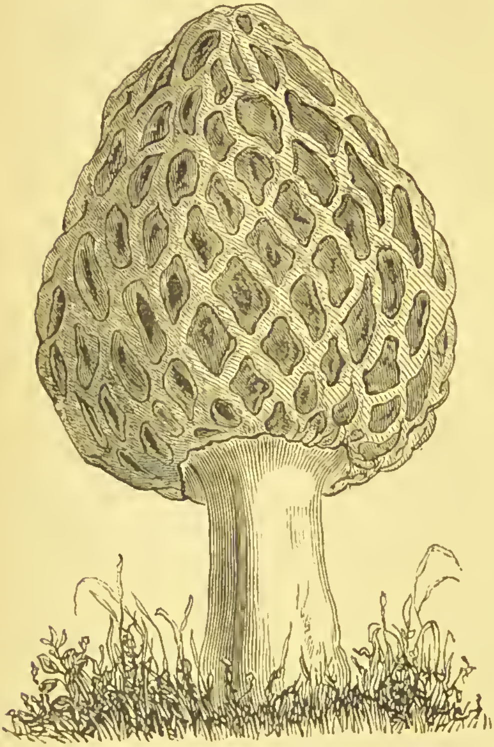

FIG. 24.—THE MOREL.

Britain from the continent, and are to be procured in Italian warehouses, but are an expensive luxury, and are used chiefly for flavouring dishes. As this fungus is not easily confounded with any other, so that no danger is to be dreaded, it seems extraordinary that it is not carefully sought for and gathered wherever it grows in England or Scotland, as well as on the continent. It may be prepared for use in various ways, and forms a rich dish when stewed. There are several other species of morel, all nearly resembling the common morel in appearance and in properties. The Bohemian Morel (*M. Bohemica*) has a stem from six to eight inches high, and a thimble-shaped cap. It is very plentiful in Bohemia, and after being dried in an oven, forms a considerable article of export. The name morel is also given in Germany to some edible species of *Helvella*, a genus allied to *Morchella*, but differing from it in having the cap turned downwards and lobed, with a smooth surface. The *Helvellæ* are sometimes called Mitre Mushrooms. *H. esculenta* has been found in plantations of fir and chestnut in Surrey. Other species occur in various parts of Britain; but all are utterly neglected, although they are in general use on the continent.

Truffles, well known in our shops as an article of luxury imported from the south of Europe, are fungi of a genus very different from any of those already noticed ; the whole plant consisting of a fleshy, firm, roundish mass, full of veins and minute cavities, in which the spores (seeds) are produced. They are remarkable as growing entirely underground. The Common Truffle (*Tuber cibarium*) is plentiful in some parts of the south of England, in woods, particularly in beech woods, and is probably much more common than has been generally supposed, passing unnoticed on account of its subterranean growth. In some districts of the south of France, the gathering of truffles gives employment and affords subsistence to many poor people, and dogs are trained to seek them, which discover by scent the spot where they grow underground. The use of truffles as an ingredient in sauces and rich dishes is well known. There are several species, all very similar in appearance and quality. The common truffle is distinguished in Germany by the name of Black Truffle; whilst the name White Truffle is given to *Rhizophagon album*, a fungus of a nearly allied genus, also a native of England, but rare. It grows half above ground, is of a whitish red colour, and is smaller than the common truffle, being generally about the size of a large walnut. It is also less aromatic, but is used in the same way.

The other edible fungi are numerous, but none of them are ever brought to market in Britain, and they are but rarely used, although many of them are much used for food in different countries of Europe, and are wholesome, nutritious, and pleasant. They must here be passed over with very slight notice, and only a few of them can be named at all; but the reader who desires further information on this subject, will find it in Dr. Badham's work, already mentioned. Several species of *Boletus* are edible; but it is to be noticed that some of this genus have noxious properties when fresh, which, however, they lose in drying. Others are perfectly wholesome in a fresh state. Among these is *B. edulis*, a species which has been in general use in Italy from the times of the ancient Romans, who, not contented with the supply to be obtained in their own country, imported this fungus from Bithynia. They called it *Suillus*, and it is now called *Porcino* in Italy. Strings of dried Porcino are sold during winter in every market-place in Italy. The flesh of this fungus is tender and juicy, and it imparts an agreeable relish to any food with which it is cooked. Soup is made of it in Hungary. In appearance the plant resembles a large mushroom, but it has pores instead of gills on the under side of the cap, and the upper surface of the cap is of a brown colour. *Cantharellus cibarius* is abundant in woods in Britain. It resembles an agaric, but has veins in place of gills. The cap is about an inch and a half in diameter, the colour of the whole plant yellow. When raw, this fungus has a pungent, pepper-like taste. It is used with meat in stews. The poorer classes in Italy use it in great quantity; they dry it, pickle it, or preserve it in oil for winter use. Somewhat similar to this is *Hydnum repandum*, also common in woods in Britain. On the under side of the cap it has soft spines instead of gills. It has an unpleasant peppery and saline taste when fresh, but when stewed it is an excellent dish, and is one of the most esteemed fungi of Italy. *Fistulina hepatica* is a fungus of peculiar appearance, growing on old oak and chestnut trees. When young it resembles a tongue, when older it has a remarkable likeness to a piece of liver. It varies in size from that of a small kidney to several feet in circumference, and a single plant sometimes weighs many pounds. When grilled it much resembles broiled meat, and it yields a very rich gravy. It is abundant in the oak woods of England, and might well contribute, as it does in Italy and Germany, to the food supplies of the people. Many species of *Polyporus*—the same genus which yields tinder or *amadou*—are used for food on the continent of Europe; some of the species, however, are too tough to be thus used. All the species of *Clavaria* are edible. *C. coralloides* is not uncommon in woods and heaths in Britain. It is a beautiful fungus, of a white colour, and dividing into many branches. It may surprise some readers to be told that several species of Puff-ball are eaten in Italy and other countries, particularly *Lycoperdon plumbeum* and *L. bovista*. They are, of course, only fit for use when young, and they must be used soon after being gathered.

More attention has here been devoted to the edible fungi than probably would have been, if they were not so generally and unreasonably neglected in this country. A very different sense of their value is commonly entertained on the continent of Europe. It is supposed that in the market of Rome alone, fungi are sold to the value of £4000 a year. The cultivation of some species is also practised to a considerable extent, in Italy and elsewhere, by watering the ground with water in which mature plants have been bruised. Their minute spores or seeds are thus distributed.

Of the great order *Algæ*, consisting entirely of aquatic plants, no species is known to be poisonous, although some sea-weeds have peculiar and disagreeable flavours. Many species are used for food in different parts of the world, and probably, if due attention were paid to the subject, many more might be found fit for this use, for the *Algæ* generally abound in a mucilaginous nutritious substance.

Carrageen or Irish Moss (*Chondrus crispus*) is common on rocky sea-shores in Britain and most parts of Europe, and also on the eastern coasts of North America. The popular name Irish Moss is apt to mislead, as the plant is a sea-weed and not a moss. It has been long used as an article of food by the peasantry of the coasts of Ireland, but its use was confined to them till about forty years ago, when it was introduced to general notice by Mr. Todhunter, of Dublin, who recommended it for its medicinal virtues, and as particularly suitable for consumptive and scrofulous patients. It derives its value partly from the iodine which, in common with other sea-weeds, it contains, and partly from its nutritiousness. It is also emollient and demulcent. About 79 parts in 100 of the substance of the plant consist of a kind of vegetable jelly, which has received the name of *Carrageenin*, and 10 parts more of mucus. The plant is from two to twelve inches long, narrow at the base, divided by repeated forking, and expanding towards the tips, cartilaginous, flexible, and of a reddish brown colour. It is bleached and dried in the sun, packed up, and sent to market. If kept in a dry place, it suffers no change for a long time. Boiled with a little water it forms a stiff jelly, and with milk, an agreeable kind of blancmange. Other species of *Chondrus*, as well as *C. crispus*, form part, although a much smaller part, of the Carrageen of our shops. One of these species is *C. mamillosus*.

Carrageen is the most valuable of the British seaweeds used for food. Some other species are, however, used to some extent, as Dulse, Laver, Tangle, and Badderlocks. The cry 'Dulse and tangle' is common in the streets of some sea-coast towns. Dulse (*Rhodomenia palmata*) grows on rocks in the sea, and is common on all rocky parts of the British coast. It consists of a flat membranous frond, broadly wedge-shaped and palmated, of a purplish colour. It has a peculiar smell, resembling that of violets. It is eaten either raw or roasted, and is much relished by many, although it requires much mastication. Dulse is nutritious, and is much used for food by the Icelanders, who dry it and store it in casks, to be eaten with fish. It is also a considerable article of food in some of the islands of the Grecian Archipelago. When dulse is dried, a saccharine efflorescence appears on the frond. In Kamchatka, a fermented liquor is made from it. The name dulse is given in the south-west of England to another sea-weed (*Iridæa edulis*) with a flat undivided purplish frond. It is eaten either raw, or after being pinched between hot irons. Pepper Dulse (*Laurencia pinnatifida*), which has a compressed cartilaginous frond, twice or thrice pinnatifid, possesses the same nutritious properties with the species already named, and also a considerable amount of pungency. Laver or Sloke (*Porphyra* *laciniata* and *P. vulgaris*), common on rocks and stones in the sea during summer, has purple fronds, which are flat and very thin, clustered and deeply cleft in the first-named species, undivided in the second. Laver is often stewed and brought to table as a luxury ; it is eaten with salt and pepper, often also with vinegar or lime juice. It is said to be useful in scrofulous affections and glandular tumours, probably owing to the iodine which it contains. Green Laver (*Ulva latissima*) possesses similar properties, and is used in the same way. It is very abundant on the British shores. It has a broad, oblong, wavy, and almost pellucid frond, of a bright green colour, sometimes inflated. Tangle (*Laminaria digitata*) is very abundant on the British coasts. It grows on rocks in deep water, and is one of our largest sea-weeds, sometimes attaining a length of twelve feet or more. It has a woody cylindrical stem, expanding into a single leathery roundish frond, deeply cleft into numerous segments. In a young state it is employed as food both for man and cattle. Old plants, thrown up by the waves, are used, along with *fuci* and other large sea-weeds, for manure. Other species of *Laminaria*, found in different parts of the world, resemble this in their properties. Another large sea-weed used for food is Badderlocks (*Alaria esculenta*), often called Henware. It also grows on rocks in deep water, and is often twelve, and sometimes even twenty feet long. The part used for food is the midrib of the frond. The frond is simple and sword-shaped, but the stem is curiously winged with small leaflets. The whole plant is of an olive-green colour.

Corsican Moss (*Plocaria helminthocortum*) is a native of the coasts of the Mediterranean. It is a small plant, divided into many filiform entangled branches. At one time it was in high reputation in medicine as a vermifuge ; but it is now believed to be of little value in this way. It is, however, very nutritious. A similar species (*P. tenax*) is much used for food by the Chinese, who also make from it an excellent glue ; and another (*P. candida*), called Ceylon Moss, is exported in great quantities from the islands of the Eastern Archipelago to China, forming part of the cargo of almost every junk.

It may well be doubted if the value of sea-weeds as articles of food has yet been properly appreciated. The abundance in which some of them are produced, and the nutritious substance known to exist in all, or almost all, and to form the greater part of many, suggest the probability that a great supply of food might be obtained from this source.

It may be mentioned, in conclusion of this chapter, that the edible nests so highly prized by the

Chinese, for thickening rich soups—the nests of a species of swallow abundant in some parts of the East Indies—are made of sea-weeds of the genus *Gelidium.* The species of this genus are almost entirely gelatinous. These nests are built on sea-cliffs, and are collected by men who descend by means of ropes, like the rock-fowlers of our northern isles. They are collected after the young swallows are fledged. When cleaned and ready for use, they they are sold in China at a price equal to £2, and upwards, to £7 per pound. They are, of course, used only by the most wealthy. The Chinese ascribe to them many imaginary virtues; but they are unquestionably a very nutritious article of food.

CHAPTER LVI.

SUGAR.

SUGAR is a product both of the vegetable and of the animal kingdom. It contributes not a little to the nutritive value of milk, and of some other animal substances. All the sugar of commerce, however, and almost all that is used in a separate form for economic purposes, is obtained from plants.

Sugar must be regarded not as a mere article of luxury, but as a real and important article of food. It is true, indeed, that sugar is not, by itself, sufficient for the support of human life, but this is no reason for supposing that it is not nutritious. No single product either of the vegetable or animal kingdom is capable of affording proper nourishment ; those animal and vegetable substances which by themselves constitute almost the whole food of some savage tribes, or of some of the poorest classes in civilised countries, contain several organic products chemically separable, and on the combination of these their nutritive value depends. Milk is an example of a substance in which such a combination exists, in such a manner that it is more suitable than almost any other to be used for a considerable time as a sole article of food; and, as has already been mentioned, sugar is one of its constituents. Beet-root would by itself support life longer than the sugar obtained from it, although it would be a very unsatisfactory kind of food. The juice of the sugar-cane, containing gluten and other substances as well as sugar, is very nutritious, and it has often been remarked that the negroes of the West Indies become fat at the time when the cane is ripe. It is not, however, from eating sugar, but from eating the cane, of which great quantities are consumed in this way. The stems of sugar-cane are constantly exposed for sale in the markets of towns in tropical countries; and in the South Sea Islands a child has almost always a piece of sugar-cane in its hand. The Roman poet Lucan mentions this use of the sugar-cane,—perhaps the only use of it known to him,—speaking of those 'who drink sweet juices from the tender reed:'

> 'Quique bibunt tenerâ dulces ab arundine succos.'[1]

Sugar was known to the ancient Greeks and Romans only as an import from the East, and was to them an article of curiosity more than even of luxury. Yet the sugar-cane has been cultivated, and sugar extracted from it, in China and other parts of the East Indies from remote antiquity. The use of *jaggery*, the sugar obtained from the juice of palm trees, has also been common in the East Indies from time immemorial.

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[1] Lucan's *Pharsalia*, B. iii. l. 237.

The Sugar-cane (*Saccharum officinarum*) yields the chief part of the sugar of commerce. It is a plant of the natural order *Gramineæ*, or grasses,—a large grass, perennial, with a creeping root, which sends up a number of stems or *culms*, an inch or two in thickness, and generally from eight to twelve feet, but sometimes twenty feet high. The leaves are ribbon-shaped, about an inch broad, and from three to five feet long. A leaf springs from each joint of the stem. The flowers are produced in great diffuse panicles of about a yard in length.

Although sugar had begun to be introduced into Europe as an occasional article of commerce in the times of the ancient Romans, nothing was generally known of its origin till the middle of the thirteenth century, when it was revealed by the celebrated traveller Marco Polo. About the same time the cultivation of the sugar-cane was introduced into Arabia, Nubia, and Egypt. Early in the fifteenth century it extended into Europe,—first into Sicily, and thence into Spain. Soon after the discovery of the New World by Columbus, the sugar-cane was carried to the West Indies, and it has ever since been largely cultivated there, so that sugar has been the chief article of export. The cultivation of the sugar-cane in Europe is almost entirely limited to Sicily and Andalusia. In China it extends to N. lat. 30°; in North America, to N. lat. 32°. In the southern hemisphere it is nowhere prosecuted at a higher latitude than 22°.

There are numerous varieties of the sugar-cane, as of all other long-cultivated plants. The kind first introduced into the West Indies is now little cultivated, the Otaheitian cane being generally preferred. This variety was brought from the South Sea Islands by Bougainville and Bligh. It attains a greater height than the common kind, and the intervals between the joints are longer. There are also other differences, particularly in the flowers, on account of which it has been described as a distinct species, under the name of *Saccharum violaceum.* A kind much cultivated in China—the Chinese Sugar-cane (*S. Sinense*)—is also regarded by some as a distinct species; but it is very doubtful if these are more than mere varieties. The Batavian or striped cane, said to be originally from Java, is much cultivated in the East Indies, and also now in many parts of the New World. It is particularly esteemed where the production of rum is a chief object of the planter. The varieties of cane differ greatly in the amount of sugar which they yield, and still more in the length of time which elapses between the planting of a field and the reaping of the crop. The old, or common variety of the West Indies, takes from twelve to twenty months for its growth, whilst the Otaheitian and other new varieties reach maturity in about ten months. Some varieties are also preferred in subtropical regions because of their suitableness to the climate, not requiring so much heat as the other kinds, or being more capable of enduring occasional cold weather.

The sugar-cane is generally propagated by cuttings. For this purpose the top joints are used. The ground is marked out in rows two or three feet apart, and the cuttings are placed at intervals of about two feet. The further cultivation consists chiefly in keeping the ground clear of weeds, which, until recently, was always accomplished by hand-hoeing,—a chief employment of the negroes in the West Indies,—but the plough is now used. The sugar-cane *tillers* like wheat and other grasses, producing a number of stems from the same root. After the first crop is cut, fresh stems spring from the root, so that it is not necessary to renew the plantation for several years; but the stems produced become in a few years comparatively small, and of inferior value. The ordinary practice, therefore, is to renew the plantation of part of a cane-field every year. Some planters never grub up and replant any part, but merely plant new canes in place of those which are no longer sufficiently productive. It need hardly be said that this is not the practice of those who carry the cultivation of the sugar-cane to its greatest perfection.

In the West Indies the sugar-cane has, in many cases, been cultivated on the same land without intermission for a long time, even for a century or more. The extreme fertility of the soil permitted this; but there is of course a limit, which may not be overpassed, even in the best soils. Adam Smith, in his *Wealth of Nations*, published towards the end of last century, took notice of the continued successful cultivation of the sugar-cane on the same land in the West Indies, and expressed the opinion that the limit would by and by be reached, and that the success of the planters would cease, unless some change of practice were adopted; an opinion which was at that time derided by those most nearly concerned, but which has now been too sufficiently confirmed by facts not to be disputed. The prosperity of the West Indian planters, once so great, has declined more in consequence of this than of any other cause.

For the extraction of sugar from the sugar-cane, the cane is cut with a large knife, the top being chopped off and left in the field, whilst the lower part, which is most abundant in sugar, is carried to the mill. The cane is crushed, and the expressed juice clarified by the addition of lime and other means, after which the juice is boiled down, and the sugar crystallizes as it cools. If the juice is not immediately boiled, it ferments, the gluten which it contains causing very speedy fermentation. The lime is used to neutralize the acetic acid which exists in the juice, as well as otherwise to aid in clarifying. When the juice is heated, the gluten and albumen which it contains rise to the surface, and form a thick scum or cake, from beneath which the boiled liquid is drawn off by a stop-cock, to be further boiled down into a syrup. The sugar, in the small crystals in which it forms in the syrup, is the *Brown Sugar*, or Muscovado Sugar, of commerce. The further processes of the refining of sugar cannot here be described. It may be mentioned, however, that in India, a very primitive sugar-mill is still commonly used for crushing the sugar-cane—a lever, wrought by the hand, bringing a wooden pestle to bear on it in a kind of mortar. It is almost needless to add that, in this way, the cane is not sufficiently crushed to yield all its juice, and much sugar is therefore lost. Of late great improvements have been made in the West Indies, and other countries, in the methods of crushing sugar-cane, and in the processes of what may be called the manufacture of sugar. Steam engines are now very generally employed, and the sugar-mills of extensive plantations resemble large factories.

What remains of the syrup after the sugar has crystallized, is *Molasses*, or *Treacle*, a considerable article of commerce, containing a quantity of sugar, chemically somewhat different from that which has crystallized. *Rum* may be made from sugar, but is commonly made from molasses, from the scum of the boilers, and other refuse. A spirit, called *Taffia*, is also made from the fermented juice of the cane. It is very different from rum, and has a harsh, bitterish flavour.

The stems of many grasses contain sugar. Those of maize, or Indian corn, yield it in considerable quantity, so that it is sometimes extracted for use. Maize sugar was prepared and used by the Mexicans before the Spanish invasion. The manufacture of it has been attempted in the United States of North America, and with such success, that some farmers have made sugar enough for domestic consumpt. It has also been attempted in the south of France; and Johnston, in his *Chemistry of Common Life*, mentions a small manufactory in the neighbourhood of Toulouse, as producing about 20,000 lbs. of maize sugar a year. It seems, however, that maize cannot compete with the sugar-cane and other best sugar-producing plants, so as to make the manufacture of sugar from it profitable, except in peculiar circumstances.

A much better sugar-producing grass is the Sorgho, or Chinese Sugar-grass (*Andropogon saccharatus*, or *Sorghum saccharatum*), the *Shaloo* of India. It has already been mentioned among the corn-producing grasses. (See pp. 71, 72.) It has recently been introduced into cultivation in North America, as a sugar-producing plant, and its cultivation has rapidly extended, and become very general. The sugar-grass was introduced into Europe by the Count de Montigny — the French consul at Shanghai — in 1851. Of the package of seed sent by him to the Geographical Society of Paris, only one seed germinated. From this single plant a small quantity of ripe seed was obtained. Messrs. Vilmorin, Andrieux, & Co., seed-merchants in Paris, purchased eight hundred seeds derived from it, and paid eight hundred francs for them. Another portion of the same crop passed into the hands of the Count de Beauregard, and from this source the seed was distributed over Europe, and thence over America. The first seeds were carried to America in 1857. In 1859, Mr. Wray brought seed from Africa to America, and two varieties, or classes of varieties, are now recognised there — the Chinese, or *Sorgho*, and the African, or *Imphee*. In 1862 more than 100,000 acres were devoted to the cultivation of the sugar-grass in the United States, and the extent of land thus employed has since greatly increased. It is chiefly in the north-western States that the sugar-grass is cultivated, but the farmers of the eastern States have also begun to engage in its cultivation, although in the most northern parts of the United States the seed does not ripen well, and seed must be obtained from more southern regions. The seed is sown in spring, as soon as the frost of winter has disappeared. It is sown in rows about four feet apart, and the plants are thinned out to at least twelve or eighteen inches between the rows. Other modes of cultivation are adopted, of which it is unnecessary here to take notice. The stalks begin to become sweet before the flowers appear, and become sweeter until the seed begins to be formed, after which the sugar is, perhaps, in part consumed by the ripening seed. The proper time for harvesting is when the seed is not quite ripe. The leaves are good fodder for cattle.

It seems probable that the cultivation of the sugar-grass will not only soon be carried on to a great extent in North America, but will attain importance also in the south of Europe, and in other parts of the world. How far, without a protective duty, it is capable of competing with the sugar-cane as a sugar-producing plant, is a question which it would be difficult at present to answer.

Mills of various kinds are used for crushing the stems of the sugar-grass and expressing its juice. A kind in common use in America consists of three horizontal rollers, an upper one resting on the other two. Mills with vertical rollers are also employed. Great part of the sugar-grass grown in America is crushed by the farmers themselves in small mills, and much of the syrup is used without being converted into sugar. The juice, as it is obtained from the mill, contains many impurities,—earth, small fragments of the stem, and green vegetable matter. These are, in part, removed by filtering, and a filter of straw is often employed. They are more completely removed by skimming during the boiling of the juice; but if no further means are adopted, so much of them still remains as to give the syrup a dingy appearance. The further processes for obtaining sugar from the sugar-grass resemble those employed in tropical countries for obtaining it from the sugar-cane.

Sugar is extensively manufactured in France and Germany from the root of beet. (See p. 200.) The roots of carrots, parsnips, and other similar plants, contain a considerable quantity of sugar; that of beet particularly abounds in it. The celebrated Prussian chemist, Margraff, discovered the existence of sugar in beet-root, about the year 1747. Forty years later, his experiments were repeated by Achard, another Prussian chemist ; and attention was directed to the possibility of a manufacture of beet-root sugar in Europe. A committee of the Institute of Paris, however, decided against it in the year 1800. But the decrees of Buonaparte in 1809, putting a stop to the importation of West Indian sugar into his dominions, led to a renewal of the experiments as to the extraction of sugar from beet-root, and the result was so satisfactory, that an imperial manufactory of sugar was established at Rambouillet, and beet-root sugar began to be made throughout the French empire. The peace of 1814 put a stop to the manufacture of beet-root sugar for a time, because West Indian sugar again came into the market, and was cheaper. For a long time the manufacture of beet-root sugar in France and Germany depended mainly on protective duties. It has now, however, gained such a position, that its produce can compete on fair terms with that of the sugar-cane imported from the East or West Indies. Beet is extensively cultivated for its sugar, and there are many large sugar manufactories. Beet-root sugar is not equal in quality to the sugar of the sugar-cane. It is less sweet, so that three teaspoonfuls may be requisite where two of the other kind would be enough. It is said, however, that a large quantity of this sugar is imported into Britain, and is sold as sugar, without reference to its origin; the purchaser, of course, suffering the loss caused by its inferior sweetness, although, probably, attracted by its beautiful crystallization.

The manufacture of beet-root sugar is very simple. The root is ground to a pulp between saw-toothed rollers, a small stream of water trickling over the teeth to keep them clean. The juice is then squeezed out by strong pressure, and the solid part of the pulp remains as a dry cake. Or the root is sliced, and the sugar extracted by hot water. The saccharine liquor produced in the one or the other of these ways, is mixed with quicklime, which *precipitates* the sugar, that is, causes it to separate from the liquor, and to settle in a solid form in the bottom of the vessels containing it. The raw sugar made from beet has an unpleasant taste, and it is therefore generally refined before it is brought to the market. The molasses produced in the manufacture of beet-root sugar has also a disagreeable taste, and cannot be used like the molasses of cane-sugar.

In France and Belgium the crops of sugar beet average fourteen or fifteen tons an acre; but in some parts of Germany they do not exceed ten or twelve tons. The German beet, however, is richer in sugar than that of France and Belgium.

Palm Sugar, called *Jaggery* in India, is obtained from the juice of palms. Many species yield it, and, indeed, all the large palms. The top-shoot is cut off, or wounded, and the juice which flows in large quantity from it, is received in vessels placed for the purpose. This juice is the *toddy* of the East Indies—a pleasant beverage when fresh, and which, rapidly fermenting, yields palm wine, and afterwards, by distillation, a spirituous liquor called *Arrack*. *Arrack*, however, is in India the name for spirituous liquors in general, as brandy (*Brantwein*) is in Germany; so that it is applied to a liquor made from grain, as well as to that made from palm juice. The sap of the palm is boiled down to a syrup, when sugar is wanted, and the sugar then crystallizes. The Cocoa-Nut, the Gommuti Palm, the Date Palm, and other palms, yield this sugar, but it is chiefly produced by the Wild Date Palm (*Phœnix sylvestris*) of India, a species nearly resembling the date palm, and which, indeed, is doubtfully distinct from it. Palm sugar differs in no important respect from that produced by the sugar-cane, and it is said that much of the East Indian sugar now imported into Britain is derived from palms.

In North America, sugar is extracted from the juice of the Sugar Maple (*Acer saccharinum*), a tree of the natural order *Aceraceæ*, and much resembling the Common Sycamore, to which its botanical alliance is very close. This tree grows abundantly in many of the northern parts of the United States, and in Canada. It is a tree from forty to sixty feet high, and with a trunk from two to five feet in diameter. The wood is not of much value, and is chiefly used for fuel; yet it is from old trees of this species that the beautiful veneers called *Bird's Eye Maple* are obtained. The making of maple sugar is a general employment of the farmers of North America in the early part of spring. In February or March, whilst the cold is still intense, but after the sap has begun to ascend, the bole of the tree is bored with an auger, in two places, about five inches apart, and about twenty inches from the ground. The holes are made in an oblique ascending direction, at first, to a depth of about half an inch, and they are afterwards deepened to about two inches. A cut with an axe is sometimes made, instead of an auger hole; but auger holes are better. Into the auger holes, tubes of sumach or elder are inserted, to convey the sap into troughs, which are placed below. The sap is afterwards strained and boiled. Lime, eggs, and new milk are often added to clarify it; but good clear sugar may be made without their aid. The sugar may afterwards be subjected to refining processes, similar to those employed for the cane-sugar of the West Indies. Four gallons of sap yield about one pound of sugar; and the ordinary produce of a tree of good size is from two to four pounds annually. The sap cannot be kept for more than twenty-four hours after it has been drawn from the tree, and the sooner it is boiled the better. Maple sugar is superior in quality to the cane-sugar of the West Indies. The quality of the molasses produced is also superior; and the molasses of the maple is a common article of domestic use in North America. During the sugar-making season, sheds are erected in the forests, for the boiling and other processes connected with the manufacture. Three workmen attend on 250 trees, which may be expected to yield nearly 1000 lbs. of sugar.

The sap of many trees, as well as that of the sugar maple, yields sugar, although not in so large quantity. It may be obtained, however, in similar manner from the sap of the other *Aceraceæ*,—as, for example, of the Sycamore (*Acer pseudo-platanus*), one of the most common trees of Great Britain, and from the sap of the birch. The sap of the birch is, indeed, used in some of the most northern parts of Europe for the production of a kind of wine, the production of which, of course, depends on the sugar which it contains.

Milk contains a considerable quantity of a peculiar kind of sugar. When the curd is separated in the making of cheese, the sugar remains in the whey, and may be obtained in the form of crystals by boiling the whey to a small bulk, and setting it aside to cool.[1] Milk sugar is made and sold to a small extent in Switzerland and other cheese-producing countries.

Manna may be regarded as a kind of sugar. It differs from the other sugars, however, in chemical composition, in inferior sweetness, and in not fermenting even when mingled with yeast. It is produced by a number of trees and other plants, and there are as many different varieties of it as there are plants which produce it. The kind called Persian Manna or Hebrew Manna, is the produce of the Camel's Thorn (*Alhagi Maurorum*), a shrub of the natural order *Leguminosæ*, from two to three feet high, which grows abundantly in Egypt, Syria, Palestine, Persia, Bokhara, and other parts of the East. Extensive plains are covered with this shrub, which affords much food to camels, sheep, and goats. The manna exudes chiefly from wounds made by the browsing of these animals. It is used for food, and is gathered by the mere shaking of the branches. It is only in very hot weather that the exudation of manna takes place. At first it resembles drops of honey, but soon thickens into small, round, solid grains, of yellowish white colour, which cake together in little masses. In many parts of the East it is used as a substitute for sugar. Other species of *Alhagi* yield a similar product. The Manna of Mount Sinai, or Tamarisk Manna, is an exudation of a species of Tamarisk (*Tamarix mannifera*) which abounds in the country around Mount Sinai and in other parts of Arabia. This

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[1] Johnston's *Chemistry of Common Life*, i. 285.

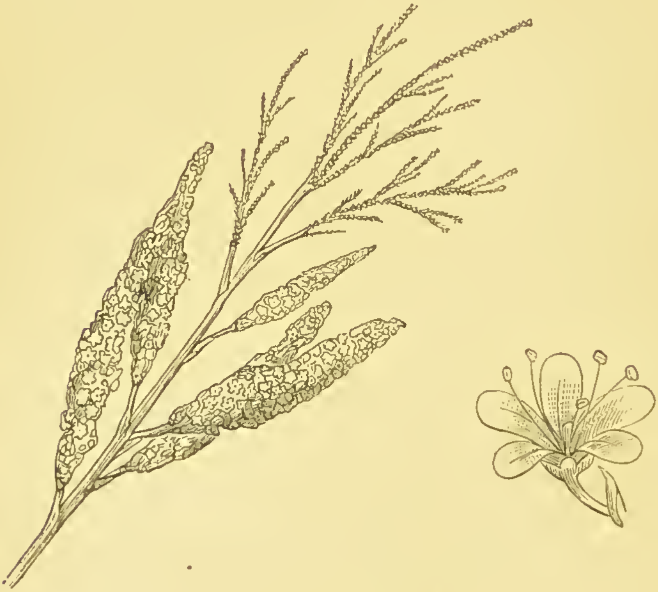

FIG. 25.—THE TAMARISK.

tamarisk is a small tree, somewhat like the weeping birch, but with still more delicate pensile branches, from which the manna flows in drops, in consequence, it is said, of the punctures made by an insect of the genus *Coccus* (*C. manniparus*). During the day the drops fall to the ground, but during night they congeal, and are gathered in the morning. 'A small quantity is collected and carried to the convent of Sinai, where it is prepared by boiling, and put into small tin cases, which are disposed of to pilgrims and other visitors.'[1] The whole quantity collected is very small, and this kind of manna must be regarded as merely an article of curiosity. The most important kind of manna, in an economical or commercial point of view, is the manna of the ash. It is the produce of *Ornus Europæa* and *O. rotundifolia*, two species of the ash family (the natural order *Ornaceæ*), natives of the south of Europe and other countries near the Mediterranean Sea. *Ornus Europæa*, commonly called the Flowering Ash, and sometimes the Manna Ash, is a small tree of twenty to twenty-five feet high. It is cultivated in plantations in Sicily and Calabria for the manna which it yields, to obtain which cuts are made in the stem in the months of July and August, and the sap is collected in vessels, or sometimes allowed to dry on the tree. The manna of our shops is mostly of this kind. A very similar kind of manna is produced by several species of *Eucalyptus* or Gum Tree, natives of Australia, particularly *E. mannifera* and *E.*

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[1] Bartlett's *Forty Days in the Desert*, quoted in Johnston's *Chemistry of Common Life*, i. 282.

dumosa. It exudes from the leaves, and dries in the sun. When the wind shakes the trees, it is sometimes seen to fall like a shower of snow. The Common Larch (*Larix Europæa*) yields, in the south of Europe, a kind of manna, which exudes from its leaves as a honey-like juice, and hardens into small globules. It is known as Manna of Briançon. In Britain no such exudation takes place, owing apparently to the greater coldness of the climate. Small globules of manna are produced on the branches of the Cedar of Lebanon (*Cedrus Libani*), and are gathered on Mount Lebanon, and sold at a price of twenty shillings or thirty shillings an ounce. It seems unnecessary to proceed further in mentioning the trees and shrubs which yield manna. Even those which have been noticed have not acquired, and they do not seem capable of acquiring, much economical importance.

Liquorice root contains a peculiar sweet substance, which, when extracted by water, becomes black, and is the well-known liquorice or black sugar of our shops. Its principal constituent is a chemical principle called *Glycyrhizin*, very different from sugar, but resembling it in its sweet taste. Glycyrrhizin is scarcely soluble in cold water, but very soluble in boiling water, and gelatinizes as the water cools. The plants which yield liquorice (*Glycyrhiza glabra* and *G. echinata*) belong to the natural order *Leguminosæ,* and sub-order *Papilionaceæ,* the sub-order having pea-like flowers. They are herbaceous perennial plants, with abundant foliage, their leaves pinnate. They are natives of the south of Europe, and of many parts of Asia, as Syria, Persia, and China. The Common Liquorice (*Glycyrhiza glabra*) is extensively cultivated in the south and middle of Europe. In Britain its cultivation is confined to a few localities, the chief of which are Mitcham in Surrey, and Pontefract in Yorkshire. Liquorice has a long pliant root, which penetrates deeply into the ground, and the soil best adapted for it is a light sandy loam. After a plantation is made, it is allowed to remain undisturbed for three years, and the roots are then dug up.

Gum is another vegetable product, used to some extent as an article of food. It is very common in the vegetable kingdom, being produced by a great number of plants very different from each other. Probably every reader of these pages has seen gum on the stems or branches of cherry trees, an exudation from wounds. Very few plants, however, yield gum in sufficient quantity to be of any economic importance. Gum Arabic, the most valuable kind of gum, is produced by several species of *Acacia,* particularly *A. vera* and *A. Arabica,* natives of Africa and of the south of Asia. It exudes spontaneously from the trunk and branches, gradually thickening and hardening by exposure to the air. Much of the gum brought to Europe is imported from Mogador in Morocco, and is gathered from acacia forests on the borders of the Great Desert of Sahara. The Moors who gather it encamp near the forest for about five weeks. They pack it in large leather sacks, and convey it to the port on the backs of camels or bullocks. A species of Acacia, abundant in some parts of South Africa (*A. karroo*), yields good gum, which has begun to be imported from the Cape Colony. The other varieties of gum cannot here be noticed. None of them are nearly equal in importance to the common kind, the produce of the acacias. Gum is very nutritious. During the gum harvest, the Moors of the African desert live almost entirely upon it; and it is often for many successive days the only food of the Bushman Hottentots. It is said that six ounces of gum are sufficient to support a man for twenty-four hours. Of course, a long-continued and exclusive use of one kind of food would not maintain health; and the nutritious character of a substance is not to be determined by its fitness for use by itself alone, but by its fitness to form one of the chief articles of food.

CHAPTER LVII.

CONCLUDING REMARKS.

THE food-supplies derived from the vegetable kingdom have now been noticed. It is impossible, within the necessary limits of the present volume, to give an account of the food-supplies derived from the animal kingdom, or of the beverages, chiefly derived from the vegetable kingdom,—the alcoholic and the non-alcoholic (such as tea, coffee, and cocoa),—which partly serve the purpose of food by preventing the waste of the human system. These subjects must be reserved for future treatment.

From the vegetable kingdom, however, we derive not only food, but also raiment. Fibres, both of endogenous and exogenous plants, are of great value in this respect. The wood of trees is also valuable for many purposes, as for housebuilding, for shipbuilding, and for making furniture and implements of various kinds. Many dye-stuffs and medicines are yielded by plants, humble lichens contributing them as well as some of the most stately trees of the forest; and to the vegetable kingdom we are indebted also for a great variety of other useful products.

The uses of plants form a most interesting subject of study; and their fibres alone, used for textile fabrics and for cordage, would require a volume as large as the present to exhibit their number and variety. But it is not to be forgotten that the vegetable kingdom contributes to our happiness, not only by the food-supplies, the fibres, the medicines, the dye-stuffs, and other useful products which it yields, but also by its beauty. The Creator has so framed it that it delights the eye, whether we look upon the palm, the pine, the oak, the heath which blossoms on the moor, the grass which covers the field, the luxuriant vegetation of the tropical forest, or the bright blue forget-me-not, which adorns the crevice of an Alpine crag, near the region of perpetual snow. Everywhere we find beauty, and in that beauty goodness,—the goodness of God towards His intelligent and rational creatures, who are capable in some measure of appreciating it and responding to it with gratitude.

In conclusion, also, it seems proper to direct attention to another particular in which the goodness of the Creator very strikingly appears, and

His wisdom equally with His goodness,—the distribution of the most useful plants over different parts of the earth, so that one country must depend on another, or rather on many others, if not for the necessaries, at least for the comforts, conveniences, and luxuries of life. Thus occasion is given for commerce, and the inhabitants of distant parts of the globe are linked together, and always the more closely as civilisation advances, to their great mutual advantage ; the general tendency of their intercourse being to promote peace, and to pave the way for the more easy and rapid diffusion of all useful knowledge, and above all of that greatest blessing imparted to man—the knowledge of the gospel of Christ.

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